THE

physical therapy

REVIEW

Volume 33 - Number 6 June 1953

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— BRUNNSTROM

Alignment and Fitting of Lower Extremity Prostheses
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A Realistic Approach to Rehabilitation
— FEUER, CHRYSTAL, and KAUFMAN

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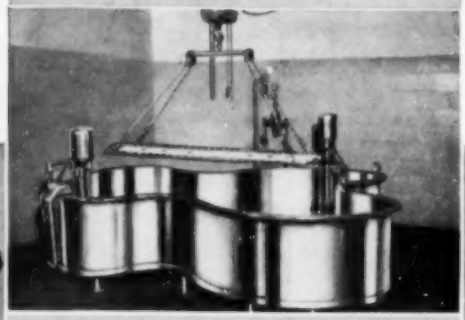

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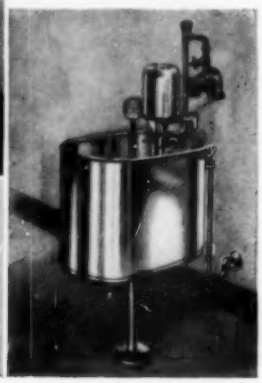

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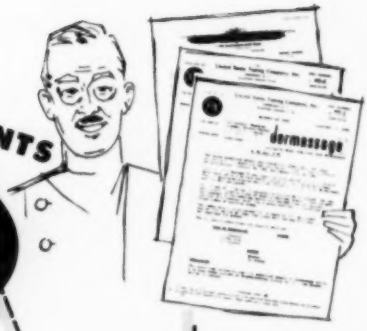

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The Physical Therapy Review

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Vol. 33 **June 1953** **Number 6**

"Haltung"

Chapter III of *Körperstellung* (Body Posture) by Rudolph Magnus*

Abstracted by Signe Brunnstrom

Introduction

In recent years a considerable emphasis has been placed on the utilization of tonic neck and labyrinthine reflexes in the rehabilitation of hemiplegics and other patients with neuromuscular disorders. A basic understanding of these reflexes is necessary if they are to be used for re-education purposes.

Tonic neck and labyrinthine reflexes in animals were first investigated by Magnus and de Kleijn, two Dutch scientists, during the early part of the twentieth century. A summary of their work can be found in physiology textbooks, but since such textbook summaries must of necessity be brief, it seemed advisable to consult some of the original publications by these scientists. Numerous shorter papers were published and a book entitled "Körperstellung" (Body Posture) appeared in 1924. Chapter III of this book proved particularly enlightening. It deals with the influence of the position of the head on the muscular tone of the extremities, the neck, and the trunk. An abstract of this chapter was made for the benefit of those who do not have the opportunity to consult the original text.

The German title of Chapter III is "Haltung." This word may be translated as "posture," "attitude," or "position." It does not necessarily refer to posture of the body as a whole, such as quadruped or erect posture, but rather to the posture of various parts of the body in relation to each other, or to their position in space. In translating "Haltungsreflexe," the expression "attitudinal reflexes" has been used.

The word "tone" or "tonus" as used by Magnus designates an involuntary tension (reflex contraction) in skeletal muscles. Tone in this sense causes rigidity; it may be responsible for maintaining a limb in a position against the pull of gravity; it is the mechanism responsible for reflex standing in decerebrate rigidity; changes in tone may cause increase or decrease in rigidity or may result in involuntary motions of the limbs. The word "tone," therefore, is not limited to the slight state of tension which is present in all healthy muscles. (S. Brunnstrom)

Haltung (Posture, attitude, or position)

Magnus states that the most important attitudinal as well as supporting reflexes are brought about by the position of the head. There are two competing influences: the tonic neck reflex and the tonic labyrinthine reflex. These are dis-

Consultant, Kessler Institute of Rehabilitation, West Orange, New Jersey; Consultant, Veterans' Administration.

* Professor, State University of Utrecht. Magnus first worked in the laboratory of Sherrington at Liverpool, then independently at Utrecht, assisted by de Kleijn and others.

cussed under eight headings. The major parts (1-7) of this chapter deal with reflexes in animals and only the last part (8) discusses tonic neck and labyrinthine reflexes in man. The chapter divisions are listed in the following manner:

Part 1. Tonic Neck Reflexes Acting on the Extremities
Part 2. Tonic Labyrinthine Reflexes Acting on the Extremities
Part 3. General Characteristics of the Changes in Tone in Attitudinal Reflexes
Part 4. Combination of Neck and Labyrinthine Reflexes
Part 5. Tonic Neck and Labyrinthine Reflexes in Intact Animals
Part 6. Labyrinthine Reflexes Acting on the Neck Muscles
Part 7. Influence of the Position of the Body on the Motions
Part 8. Tonic Neck and Labyrinthine Reflexes in Man

PART 1. TONIC NECK REFLEXES ACTING ON THE EXTREMITIES

These reflexes manifest themselves in intact animals, but in order to exclude voluntary motions decerebrate animals are used for the experiments. For the study of the neck reflexes, impulses originating in the labyrinths must first be eliminated. This may be done by labyrinthectomy or by severing the eighth nerve. When this has been done the tone of the muscles of the extremities is completely uninfluenced by the position of the head in space and the effect of the tonic neck reflex on the muscles of the extremities can be studied without interference. Very definite and consistent reactions are obtained.

Head turning. Because conflicting terms have been used which have led to misunderstandings, the author suggests that the terms "jaw extremities" (Kieferbeine) and "skull extremities" (Schaedelbeine) be used. When the head is turned to the right, i.e., the jaw of the animal or the nose of the patient is turned to the right, the right extremities are the "jaw extremities"; the extremities on the left side are the "skull extremities."

For animal and human subjects alike, the simple rule holds true that by turning the head, the tone of the extensor muscles of the "jaw extremities" increases, while the tone of the extensor muscles of the "skull extremities" decreases. The upper and the lower extremities react in the same direction, that is, the "jaw arm" and the "jaw leg" extend or increase their extensor tone. In the case of an experimental animal, it is immaterial whether the head, before turning, is in a neutral position or whether it is dorsiflexed or ventriflexed.

Head side bending (Kopfwenden). In right head side bending, the right ear approaches the right shoulder. If, in decerebrate animals, the head is bent to the right, the extensor tone increases in the right upper and lower extremities and it decreases in the left extremities. The position of the head, as far as dorsiflexion and ventriflexion is concerned, does not influence the results.

Head raising and lowering (dorsiflexion, ventriflexion). In all experimental animals the tone of the extensors of the forelimbs decreased when the head was ventriflexed; it increased when the head was dorsiflexed.* In the case of cats, dogs, and guinea pigs, the hindlimbs reacted in the opposite direction of that of the forelimbs; the hindlegs flexed when the head was dorsiflexed and extended when the head was ventriflexed. Only in the rabbit was the reaction different, inasmuch as the forelimbs and hindlimbs were influenced in the same direction; flexion of all four limbs was obtained when the head was ventriflexed, and vice versa. Raising or lowering of the head produced reflex action on the limbs only if the motion took place in the cervical spine proper; atlanto-occipital motion was ineffective.

The reflex action on the limbs from raising and lowering the head must be distinguished from the vertebra prominens reflex. The latter is elicited by pressure on the spinous processes of C7 or D1, or by pressing the entire neck ventrally, the pressure being applied on the lower part of the cervical spine. This reflex causes all four extremities to flex simultaneously, usually the forelimbs more than the hindlimbs. This is the posture assumed when the animal lies flat with head, chest, and belly on the ground.

Severing the posterior roots of C1, C2 or C3 bilaterally in an animal, abolished the neck reflexes, while in the same animal the vertebra prominens reflex could still be elicited. The question whether tonic neck reflexes originate from proprioceptors in the *muscles* or in the *joints* of the cervical spine could not be determined.

The neck reflexes were elicited with equal strength and identical patterns regardless of whether the neck motions were active or passive. This held true both in experimental animals and in a few human subjects observed. Under cer-

* Note that in most human beings studied by Simons the reactions were opposite: Ventriflexion caused increase in extensor tone of the arms; dorsiflexion caused increase in flexor tone.

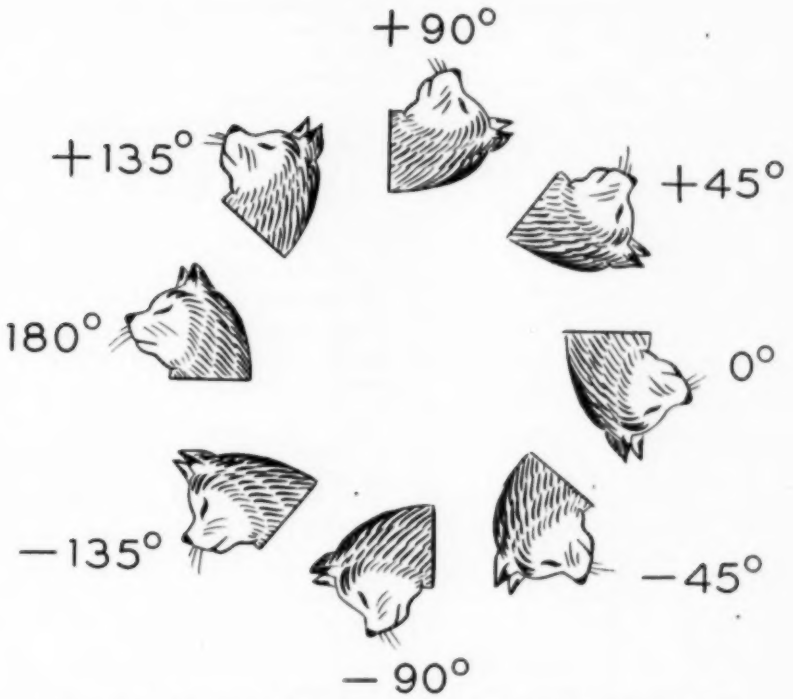

Figure 1. Head positions used for investigation of tonic labyrinthine reflexes in cat.

tain circumstances, and with certain types of brain pathology, neck reflexes in human beings are elicited in the typical animal fashion. Dr. Stenvers, Utrecht, demonstrated on a patient (motion pictures) that both active and passive head turning was accompanied by extension of the "jaw arm" and flexion of the "skull arm."

The nerve centers for the tonic neck reflexes are located in the upper portion of the cervical cord (Magnus 1914). When, after removal of the cerebellum in a decerebrate cat, a frontal section was made through the medulla oblongata just behind the entrance of the eighth nerves into the medulla, tonic labyrinthine reflexes could not be elicited. The same held true if the section was made caudally through the calamus scriptorius. In such experimental animals, tonic neck reflexes were still present. When the section was made just caudally to the entrance of the first cervical nerves, the reflex could still be observed, but the reaction was less marked. A section caudally to the entrance of the second cervical nerves usually abolished the neck reflexes. Occasionally it was necessary to go slightly beyond the second cervical to abolish the reflex. From these experiments it was concluded that the centers for the tonic neck reflexes are located in the two highest cervical segments of the cord.

Part 2. Tonic Labyrinthine Reflexes Acting on the Extremities

In order to eliminate motions of the neck which would cause the appearance of neck reflexes in the experimental animal (cat), a plaster cast was applied, incorporating head, neck, and thorax, leaving the extremities free. It is also possible to eliminate the neck reflexes by severing the posterior roots of C1, C2, and C3, but in that case, the vertebra prominens reflex would remain intact, and this might lead to errors.

The tonic labyrinthine reflexes are investigated as the animal is turned slowly in such a manner that the head assumes, progressively, the positions in space illustrated in Figure 1.

The rules for the tonic labyrinthine reflexes

acting on the muscles of the extremities may be summarized as follows: The four extremities react in the same direction; there is only one position in space which causes a maximum extensor tone in the four extremities, and only one which causes a minimum tone; the maximum and the minimum positions are 180 degrees apart. Usually, the position for maximum tone is +45 degrees, for minimum tone −135 degrees. Sometimes, the maximum position lies between 0 and +45 and the minimum between 180 and −135 degrees.

When, from the 0 position of the head, the snout of the animal is raised until the cleft of the mouth has reached +45 degrees, a maximum extension of all the extremities occurs; they become rigid. As the motion continues until the snout points straight upward (+90 degrees), the extensor tone diminishes and the tone decreases still more as the positions +135 and 180 degrees are reached. At −135 degrees the extensor tone is at its minimum; the legs are flaccid and can easily be flexed. In this position, the animal is held abdomen down and the tail end of the animal is higher than the head. If the turning is continued the tone rises gradually. It can usually be definitely felt at −90 degrees. At −45 the extensor tone is quite marked and it rises to a maximum when the starting position (backlying) has been reached. If rubber bands are slung around the neck of the animal and around its paws the extensor tone is sufficiently strong to cause extension of the forelimbs against considerable resistance by the rubber bands (Figure 2). The reaction occurs quite slowly. In one case observed, extension of the limbs took place seven and one-half seconds after the completion of the turning motion. The extensor tone remained as long as the position was maintained.

When the labyrinths of experimental animals were injected with cocaine or the eighth nerve was severed no changes in tone were obtained by turning the animal in the above described manner. The tone of the muscles of the extremities was of medium strength throughout the motion. Step by step sections through the central nervous system of decerebrate animals demonstrated that the midbrain and the cerebellum could be removed without causing a disturbance of the labyrinthine reflex but that labyrinthectomy or section of the eighth nerves abolished the reflex. These and other experiments lead to the conclusion that the centers for the labyrinthine reflex lie caudally to the entrance of the eighth nerves into the medulla.

Since in the tonic neck reflexes the right and left extremities react in opposite directions, and in the labyrinthine reflexes in the same direction, these phenomena can be utilized for differentiation between the two reflexes.

The experiments further showed that one labyrinth was sufficient to bring about the reflex bilaterally. When one labyrinth was destroyed the right and left sides reacted equally well. This held true of the rabbit, cat, dog, and monkey.

PART 3. GENERAL CHARACTERISTICS OF THE CHANGES IN TONE IN ATTITUDINAL REFLEXES

Both in the case of the tonic neck reflex and in the case of the tonic labyrinthine reflex, actual extension of the extremities was seen. The tone in the extensor muscles was able to overcome a considerable amount of resistance (rubber bands or weights). When the load was kept constant the muscle shortened (isotonic contraction), and when the length was constant the tension rose (isometric contraction).

The strongest reactions were obtained in shoulder, elbow, hip, and knee joints, with less marked reactions at ankle and toe joints; however, abduction of the toes as well as a protrusion of the claws was occasionally seen.

In animals where decerebrate rigidity was mild, extension of the extremities was not always obtained. In such cases the following method was used to determine increase or decrease in extensor tone. The extremity was first passively extended. Thereafter, the joint was passively flexed until the extensors could be felt opposing the motion. The angle at which this took place was noted. In cases with maximum original tone the angle was approximately 160 degrees; with minimum original tone it was about 90 degrees. In a few cases the extensors offered no resistance to passive flexion throughout the range of motion.

When decerebrate rigidity was marked, tone was observed in the extensor muscles only—while the flexor muscles seemed completely flaccid. On several occasions, however, observations were made which showed that the flexors too were influenced by the tonic neck and labyrinthine reflexes. An experimental animal was held in the air with the abdomen down, head up. As the head was bent down (ventriflexed), the extensor tone disappeared, but the legs did not hang flaccidly down but were pulled actively toward the abdomen. The flexor tone could be felt as a resistance when passive extension of the limb was carried out. Thus, the law of reciprocal innervation (Sherrington) seems to apply also

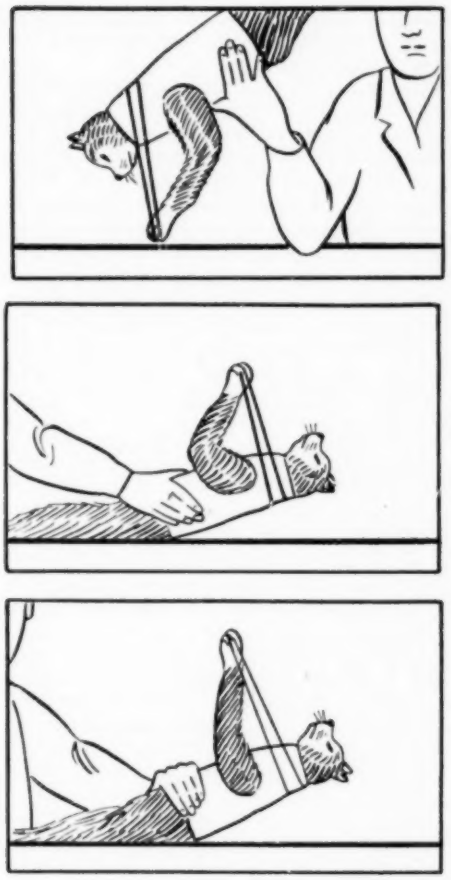

Figure 2. Frames from a motion picture showing labyrinthine reflexes in decerebrate cat. Tonic neck reflexes have been eliminated by the application of a plaster cast incorporating neck and spinal column to D9.

a. Rubber bands have been strung around the neck to the paws. The extensor tone can be judged by the tension in the rubber bands.

b. The animal has been turned around but no change in tone of the forelimbs is noticed immediately.

c. About five seconds later the limbs have extended and maximum tone has been reached. This tone persists as long as the animal's posture remains unchanged.

to neck and labyrinthine reflexes. Inhibition of the extensor tone was accompanied by increased tone in the flexors; and as the extensor tone increased, the flexor tone was inhibited.

The existence of the pattern of reciprocal innervation in connection with neck and labyrinthine reflexes was also demonstrated by Beritoff. In the experimental animal (cat), all muscles connecting the scapula and the humerus were severed. All nerves of the brachial plexus except the radial and the musculocutaneus nerves were also severed. The forearm was amputated at the elbow joint. The brachialis, the long head of the triceps, and the medial head of the triceps were connected individually to writing levers. The experiment started with the head in a middle position. Then the head was turned to one side, and after 13 seconds, to the other side. This was repeated several times. Each time when the prepared extremity became the "jaw leg," the two heads of the triceps contracted. As it became the "skull leg," the brachialis registered contraction.

Immediately following decerebration extensor rigidity is usually marked and activity in the flexors cannot be demonstrated. A few hours later, the extensor tone[9] decreases and activity in the flexors can be demonstrated as the head is being turned. In a few cases described by Beritoff, extensor rigidity subsided during the experiment, which lasted several hours, and a flexor rigidity developed. In these cases, turning of the head resulted in activity of the flexors only. This latter was also obtained by intravenous picrotoxin poisoning, which changes extensor rigidity to flexor rigidity. In such cases, maximum contraction of the flexors occurred at position −135 of the head, that is, at the position where, before injection of picrotoxin, the extensors exhibited a minimum amount of tension.

The last described experiments should not detract from the original observations that in decerebrate animals it is mainly the extensor muscles which take part in the tonic neck and labyrinthine reflexes. This has its explanation in the fact that the extensors are the antigravity muscles which are needed to maintain a standing posture.

It was noted that the neck and labyrinthine reflexes acted on the extremities even after the posterior roots of the spinal nerves which supply the extremities were severed. In an experimental animal (cat), the posterior roots of C5 through D2 were severed, then the animal was decerebrated. The right forelimb showed marked rigidity, the left was more flaccid. With the animal in the backlying position, the head was ventriflexed and dorsiflexed, and these motions caused the forelimbs to react uniformly. When the mouth cleft was at +45 degrees, there was

maximum tone in the elbow extensors, a typical labyrinthine reflex of the forelimbs. It must therefore be concluded that through the position of the head, a specific source of excitation was brought into play. Another experiment demonstrated that also the sympathetic innervation to the muscles could be eliminated without effect on the tonic neck and labyrinthine reflexes.

In decerebrate animals, the latent period of the tonic neck reflex was found to be short, usually between one-third of a second and one second. The labyrinthine reflexes, on the other hand, exhibited widely differing latent periods, between one-fourth of a second and twenty-three seconds.

In the experimental animals, extensor tone in the "jaw extremities" following head turning persisted over a long period of time. If the head was kept in the turned position, the "jaw extremities" maintained tone uninterruptedly for one entire hour. These reactions, it seems, produce very little fatigue. Additional studies showed that fatigue was absent for much longer periods of time (days, weeks, even months). It should be noted that fatigue is rapid in phasic reflexes and spontaneous motions. Sherrington found this to hold true of many spinal cord reflexes, such as the scratch reflex. The reactions described above may be considered as practically nonfatiguing.

In experimental animals with strong reflexes, it was sometimes observed that the tonic condition of the extremities was interrupted by attacks of vigorous running motions. These attacks occurred only when the tone of the extremities was marked. The running motions were inhibited by a change in head position.

PART 4. COMBINATIONS OF NECK AND LABYRINTHINE REFLEXES

In the studies described above, either the neck reflex or the labyrinthine reflex was eliminated, so that each of them could be studied separately. If such elimination is not done, the combined effect of the two reflexes may be investigated.

Reactions observed in over one hundred animals and several thousand experiments were all explainable as a combined action of the neck and labyrinthine reflexes. It may be stated that there was an algebraic summation of the two reflexes. If the tone of a certain muscle was increased under the influence of both the neck and labyrinthine reflexes, the innervation to the limb became very strong. Conversely, a very marked relaxation was seen if the tone of the muscle was inhibited by both reflexes. No change in tone was seen if the tone was increased by one of the reflexes and inhibited by the other.

It must be kept in mind that tonic labyrinthine reflexes appear only when the head changes its position in relation to the horizontal plane. If, for example, the experimental animal lies on the side, dorsiflexion and ventriflexion of the head can be performed without the head changing its position in relation to the horizontal plane. The same holds true of head side bending in the backlying position and head turning in the hanging position with the head either up or down. In these cases, then, increase or decrease in tone is to be attributed to the effect of the tonic neck reflex alone. In all other positions and motions, the combined effect of the two reflexes must be considered.

The investigation was somewhat complicated by the fact that in the various animals, the neck and labyrinthine reflexes were not equally well developed. In some animals the neck reflex predominated, in others, the labyrinthine reflex; while in others, the two reflexes were of about equal strength. This applied not only to decerebrate animals but also to animals with intact cerebral cortex.

Five different starting positions were chosen, namely, backlying, quadruped standing, sidelying, hanging with the head down and hanging with the head up. The motions investigated included dorsiflexion and ventriflexion of the head, head side bending and head turning. Motion pictures were taken during some of the experiments. Representative frames are reproduced showing clearly the effect of the reflexes on the limbs of the experimental animal (cat).

The account of these experiments occupy ten pages. Only one of the experiments will be described to illustrate the combined effect of the two reflexes.

Backlying head turning. Because of the position of the head in the starting position (+45 degrees) the labyrinthine reflex exerts maximum influence on the extensor tone of the forelimbs. By turning the head to either side, therefore, the influence of this reflex is lessened. The neck reflex, on the other hand, causes increased tone in the "jaw limb" and decreased tone in the "skull limb." The effect on the "skull limb" is the sum of the effects of the two reflexes; as a result, the exensor tone decreases and the "skull limb" flexes. On the side of the "jaw limb," the effect depends upon the relative strengths of the two reflexes. If the neck reflex predominates (as was the case in the experiment illustrated) the

extensor tone of the "jaw limb" increases. The tone in the "jaw limb" decreases if the labyrinthine reflex is predominant, and it remains the same if both reflexes are equally well developed.

PART 5. TONIC NECK AND LABYRINTHINE REFLEXES IN INTACT ANIMALS

The author shows in this chapter that both tonic neck and labyrinthine reflexes are present in intact animals (rabbits, cats). Since the discussion here is mainly a confirmation of previous observations on decerabrate animals, this section was not abstracted. It may be of interest to mention that the author found that the same receptor centers for tonic neck and labyrinthine reflexes function in the duck and that these centers serve as relay stations for inhibition of breathing when the duck dives.

PART 6. LABYRINTHINE REFLEXES ACTING ON THE NECK MUSCLES

The effect of the labyrinthine reflexes on the muscles of the neck is similar to the effect on the extremities with one difference: after ablation of the labyrinth on one side, increase in extensor tone in the extremities is obtained bilaterally on moving the head toward maximum head position; this is not the case in the neck muscles. Each labyrinth appears to have a bilateral effect on the extremities but a unilateral effect on the neck muscles.

If in the decerebrate animal ablation of one labyrinth is undertaken, the head turns toward that side and bends toward the same side. If an attempt is made to correct this asymmetrical head position by turning and bending the head toward the opposite side, a strong muscular resistance is felt.

To clarify the effect of the labyrinths on the tone of the extremities and on the tone of the neck muscles, the author uses the following analogy: Two horses representing the muscles of the right and left extremities are hitched to one wagon. On the wagon seat two coachmen represent the labyrinths. Each coachman has a complete set of reins for both horses. Just as the labyrinths on the two sides change position in an identical manner when the position of the head changes in space, so the two coachmen control the team with the reins. Should one coachman be knocked off, the remaining one can control the team alone. This demonstrates the bilateral influence of each labyrinth on the extremities.

To clarify the effect of the labyrinthine reflex on the *neck* muscles, we must assume that the left coachman has sole control of the left horse and the right coachman of the right horse. Each man conducts his horse in an identical manner, but if one man is removed, his horse will run without reins and cannot be controlled by the remaining coachman. This demonstrates the unilateral influence of each labyrinth on the neck muscles.

The labyrinths thus have a direct influence on the tone of the muscles of the extremities and of the neck. In addition, secondary tonic reflexes acting on the extremities and on the trunk muscles are elicited from the neck itself. Each change of tone in the neck muscles is accompanied by a change in tone in the extremities, and also in the trunk muscles. This sets up an intricate interrelationship between the distribution of muscular tone throughout the body.

PART 7. INFLUENCE OF THE POSITION OF THE BODY ON THE MOTIONS

A change in body position is accompanied by increased pull on certain muscle groups. In accordance with von Uexküll's tension law, the nervous centers of the muscles pulled upon are in a state of heightened receptiveness to stimulation. With each change in position, different parts of the body come in contact with the supporting surface. A number of sensory impulses, partly proprioceptive, partly exteroceptive, are set up. These impulses all influence the distribution of receptiveness to stimulation in the nervous system and thus the reactions. This explains why the identical stimulation, depending upon the position of the body, may cause either a strong or a weak reaction, or may even result in a reversed reaction. The investigator must always be aware of these phenomena.

PART 8. TONIC NECK AND LABYRINTHINE REFLEXES IN MAN

Under ordinary circumstances tonic neck and labyrinthine reflexes are not seen in man; neither can they be observed in the normal monkey. In man the matter is complicated, partially because the biped posture sets up new requirements for the maintenance of balance. The upper extremities, used as grasping organs, do not follow the same laws as the forelimbs in animals.

Tonic neck reflexes were observed in the human fetus (3rd to 5th month) by Minkowsky, but no labyrinthine reflexes were seen. Observations on newborn infants (Magnus) from a few hours after birth to three and one-half months

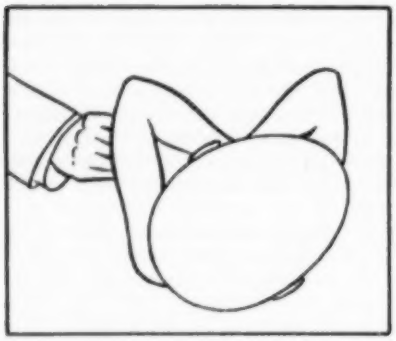

Figure 3A

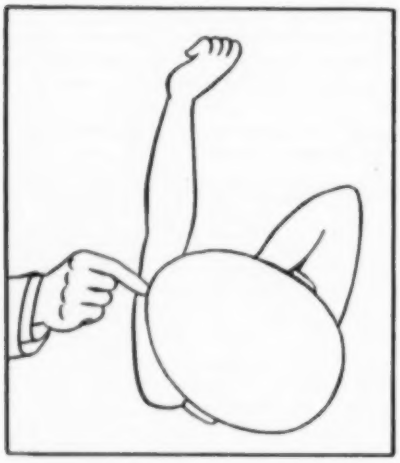

Figure 3B

Figure 3. Tonic neck reflexes in hydrocephalic child.

later, failed to detect tonic neck reflexes. Observations are difficult because of the many random motions which are seen in infants.

Tonic neck and labyrinthine reflexes become apparent in man only under pathological conditions. Tonic neck reflexes have been reported by a number of authors. Walshe also reports on labyrinthine reflexes. These, however, must be carefully distinguished from semicircular canal reactions (Bogengangreaktionen). Each time an observation is made it must be ascertained that the reflexes are not elicited by motions, but that they are actually attitudinal reactions of long duration.

In discussing tonic neck and labyrinthine reflexes in man Magnus draws heavily on observations made by others. He describes 6 cases himself and makes up a table of 22 other cases reported in medical literature.

Tonic Neck Reflexes in Man

One of the cases described by Magnus is that of a 6 year old girl with marked hydrocephalus. The child was normal until the age of 4 when she manifested convulsions and loss of consciousness. At 5 she became paralyzed and lost her speech; later she became deaf. The size of her head increased greatly between 5 and 6 years of age.

Hypertonicity was present in both upper and lower extremities. Babinski and Oppenheim reflexes were positive. Because of marked hydrocephalus, influences from the cerebral cortex were almost completely eliminated.

When the child's head was turned to the right (Figure 3a) the arms remained crossed over the chest with both elbows flexed. As the head was turned to the left the forearm extended and pronated and the hand dorsiflexed (Figure 3b). This head position was maintained for 5 minutes during which time the left elbow remained extended. When after 5 minutes the head was brought into the middle position the left elbow immediately flexed. When the head was turned to the right there was no reaction. Head sidebending, dorsiflexion, and ventriflexion of the head had no effect on the arms.

When the head was turned once again to the left, a definite extensor tone also developed in the left quadriceps, a tone which was of the "plastic" type (Sherrington). Following this there was a spontaneous extension of the left arm and the left leg.

The appearance of tonic neck reflexes in human beings is not characteristic of a special type of disease. The destruction of certain brain tracts or certain higher brain centers is common to all cases in which neck reflexes can be observed. Depending upon the type of pathology, the reactions may involve flexors or extensors, or both groups. Usually the tonic neck reflexes affect most markedly those muscles which already have a high degree of tone. In many instances Sherrington's "plastic tone" is seen; i.e., the responding muscles will keep the joint in fixation in any position to which the joint is brought, as long as the head is turned to that side. Head turning toward the opposite side causes the tone to disappear.

Apparently the centers for the tonic neck reflexes in man, as in animals, are located in the upper cervical segments of the cord.

Magnus also describes in detail clinical observations by Simons and by Walshe. These authors noticed that a change in the position of the head alone did not always cause a change in tone in the

spastic-paretic limbs, but if an associated motion was brought about by a strong voluntary contraction in one of the unaffected limbs, the motion of the affected limb followed the pattern which the turning of the head alone should have elicited. Walshe assumes that the associated motions are elicited reflexively by proprioceptors in the voluntarily contracting muscles.

Tonic Labyrinthine Reflexes in Man

There are comparatively few cases of tonic labyrinthine reflexes described in man. First, tonic neck reflexes must be ruled out, and second, it must be ascertained that the reactions are of long duration (Dauerreaktionen) and that they are elicited by a certain position of the head in space, not by a motion.

Case I exhibiting tonic labyrinthine reflexes. In a 16 month old boy with amaurotic idiocy there was an almost complete absence of cerebral function. Labyrinthine eye reflexes were present and abnormally strong. The child exhibited the typical tonic neck reflexes acting on the arms and the legs bilaterally. As the child was changed from the sitting to the lying position a typical semicircular canal reflex (Bogengang-reflex) was seen; the arms were thrown out in a symmetrical fashion, the upper arms abducted, the elbows extended, and the fingers spread apart. This reflex which was elicited from the motion, not from the posture, subsided after a while. In the back lying position the child had extensor rigidity in all four extremities. While care was taken that the position of the head did not change in relation to the trunk when it was turned on the side and then prone, the extensor tone subsided. When the process was reversed, extension rigidity reappeared. These latter reactions were obviously labyrinthine reflexes.

Maximum and minimum positions for the extensor tone were then determined by strapping the child to a padded board so that he head was kept immovable in relation to the trunk. The board was then turned, and all positions throughout the 360 degrees range were investigated. It was shown that the maximum and minimum positions were very similar to those found in experimental animals, and that, also in the case of the child, the position of the mouth could serve as a guide. The extensor tone of the four extremities reached a maximum when the head-end of the board was lowered 45 degrees from the horizontal. The minimum position was found when the board inclined 45 degrees forward from the vertical position.

Findings by Brunner in one-sided labyrinthine lesions in human beings indicate that the influence on the neck muscles is one sided, just as in animals.

It has thus been shown that tonic labyrinthine reflexes also exist in humans. These observations may have significance, inasmuch as in certain cases, spasms may be relieved by paying attention to the patient's position. It is to be noted that the supine position is unfavorable for relief of extensor spasm, and that such spasm may disappear in other positions.

Whether or not in normal persons with intact central nervous systems the tonic labyrinthine reflexes have an influence on the distribution of tone to the muscles could not be determined.

REMARKS *

From the foregoing it is seen that most of Magnus' observations were made on decerebrate animals. Although in Magnus' text from time to time references are made to reflexes in human beings, the reader must be warned against drawing the faulty conclusions that these reflexes can be seen regularly in cases of brain injury, cerebral vascular accident, or cerebral palsy. Tonic neck reflexes no doubt are present also in man, but there are good reasons to believe that they have been modified, due to the assumption of the erect posture which freed the forelimbs from weight bearing. In order to observe these reflexes in their pure form all impulses from the cerebral cortex must be blocked. Such a condition rarely exists in human beings.

A case of decerebrate rigidity in a young woman was described by Walshe, who was able to demonstrate the presence of tonic neck reflexes in his patient; however, the usual type of rigidity as seen in animals was not observed. Extensor rigidity of the legs was present, but the arms presented a flexor rigidity. Walshe suggests that this difference between decerebrate rigidity in animals and in human beings, may be due to the erect posture in man. In animals, the extensors of hind legs and forelimbs constitute the anti-gravity muscles. In humans, the extensors of the legs and the flexors of the arms are anti-gravity muscles.

It has been postulated also that a decortication in human beings causes flexion rigidity in the upper extremities and extension rigidity in the lower extremities (hemiplegic posture), but that a decerebration more caudally brings about an animal type of decerebrate rigidity involving the extensors of both upper and lower extremities.

* By the abstractor, S. Brunnstrom.

In making clinical observations on the effect of the position of the head on the tension of the muscles of the extremities the following points should be kept in mind:

1. Volitional and emotional influences may inhibit or modify the original reflex patterns.
2. Change in muscular tension may occur without a motion taking place—careful palpation must supplement observation.
3. The amount of flexion or extension tone which is present at the onset of the experiment influences the results—residual tone from one experiment must have subsided before the next one is started.
4. The limb position and the posture assumed by the entire body before the head is moved may affect the change in tone resulting from the altered head position.
5. In certain lesions the flexor tone may be so predominant that increase in extensor tone by the utilization of the neck reflex only decreases, but does not eliminate the flexor tone.
6. When treating hemiplegics, it is usually necessary to reinforce the reflexes by having the patient make a strong voluntary muscular effort on the unaffected side. This is brought about by resisted hip or elbow flexion, or the squeezing of an object in the unaffected hand.

This latter technic for producing "associated motions" (Mitbewegungen) in patients with involvement of the pyramidal tracts has been described by Simons who investigated the influence of the position of the head on the tone of the muscles of the extremities in a large number of patients with head injuries and other neurological conditions. Simons' article, referred to by Magnus, proved of such interest that it was abstracted separately and will appear in a later issue of this journal.

It is obvious that Magnus' work was known to Simons, and vice versa. Each of these authors refers frequently to the other. In order to avoid duplication of material the two abstracts have been made in such a manner that most of the quotations of one by the other have been omitted.

For the sake of clarity, it is suggested that the reader familiarize himself with Magnus' observations on animals before studying the clinical material presented by Simons, Walshe, and others.

Illustrations Redrawn from Magnus' Körperstellung

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Alignment and Fitting of Lower Extremity Prostheses

Odon F. von Werssowetz, M.D.

The lower extremity prosthesis has two primary functions. It should provide for the body a proper supporting base according to the general laws of statics, and it should reestablish the ability for active locomotion. These functions are realized by proper alignment and fitting, which is the most important single phase in providing an adequate and efficient prosthesis. Limb fitting is an art possessed by few and requiring years of training and experience. A well-fitting prosthesis, even though badly constructed, is of infinitely greater use to the amputee than one constructed of the best materials but ill-fitting.

The best fitting socket, however, will not be comfortable when improperly aligned. Alignment, the placing of joints, selecting the appropriate type of joints, the relationship of the various segments, the need for locks and controls, the question of brakes and bumpers are essentials of limb fitting art. The physician and the therapist, who are training the amputee in ambulation and rehabilitating him to meet the demands of daily living, must know in detail the mechanics of fitting and alignment, and must develop and

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cultivate this art so that they can guide the amputee accordingly. They must be able to determine when alignment or fitting is causing faulty locomotion and they should know what to recommend to obtain the best results.

Alignment and fitting are based on certain fundamental anatomic, physiologic, and biophysic principles, and understanding of these is essential for successful provision of an artificial limb. The alignment of the prosthesis should in general correspond with the alignment of the sound extremity. This requires an exact knowledge of the load line or the line of thrust of the limb to be fitted. The correct alignment is based on proper placement of the component parts of the prosthesis and the various artificial joints in proper relation to each other and to the center of gravity of the body. However, the center of gravity, which in the average normal standing individual is at the level of the second sacral segment, is found significantly elevated and with a posterior displacement. The magnitude of this shift depends on the site of the amputation or, more precisely, depends on amount of leg loss. Hellebrandt et al found that "the majority of amputees maintain the vertical projection of the center of gravity within the middle fifth of the transverse diameter of support and remarkedly close to the geometric center of the base." The amputee, in compensating for segmental loss, tends to shift the superincumbent load slightly toward the sound extremity (Figure 1). This postural realignment is a biophysical necessity and is essential for efficient use of the prosthesis, but excessive lateral shift is undesirable and must be corrected.

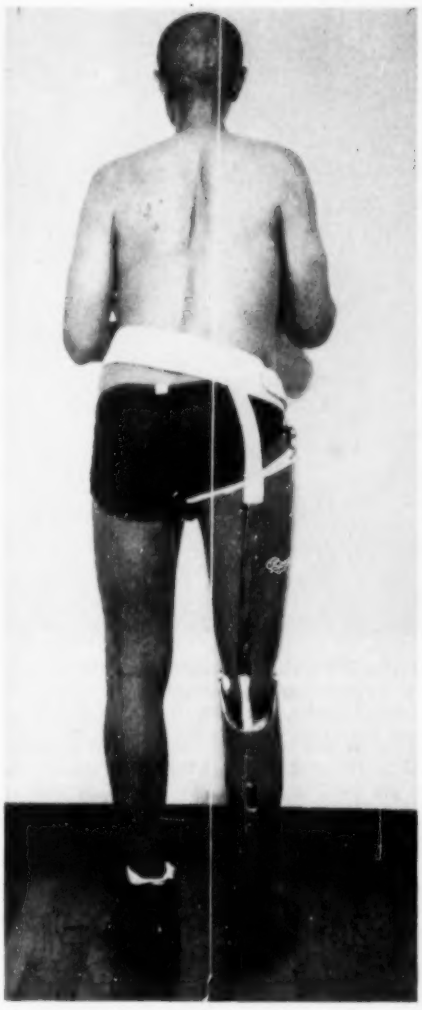

Figure 1. Shift of the superincumbent load toward the sound extremity in an A/K amputee.

THE A/K CONVENTIONAL PROSTHESIS

The most common amputations are those through the thigh. Such a stump may be provided with a conventional or suction socket type of prosthesis. The conventional prosthesis is composed of a socket and thigh piece, the leg and the foot articulated together. The length of the prosthesis usually should be such that both extremities are equal as measured from the anterior superior spines. If the prosthesis is too short or too long, then a postural scoliosis of the lumbar spine will be produced with painful symptoms. In the young, robust person the provision of equal length is a necessity. In the older amputee, sometimes, it may be advantageous to provide a shorter limb because this will facilitate the clearing of the ground during swing through on locomotion. An occupation like that of a farmer, requiring prolonged walking on rough or hilly ground, may require a shorter prosthesis. Occasionally, it may be hard to determine the proper height at the start. In such cases, strips of felt can be fastened to either shoe as necessary for trial use. After the proper height is found, the difference is incorporated into the limb.

1. The Socket

In the fitting of a thigh stump, where weight

Figure 2. Rectangular shaped socket for an A/K conventional prosthesis.

bearing is diffused over the entire surface, it must be remembered that there are certain areas that are more adaptable by nature to take such pressure, while other areas in close proximity tolerate little or no weight. Most of the A/K prostheses provide for direct bearing on the ischial tuberosity and gluteus maximus with some slight weight on the greater trochanter. No weight bearing should be given to the end of the stump and excessive pressure should be avoided in the adductor region and the crotch.

The shape of the old type of conventional A/K socket was approximately triangular. However, with recent research and findings in the field of suction socket, it has been found that a more rectangular shape provides for superior fit and better control (Figure 2). The posterior part of the rim should widen out to form an ischial seat which should be sloped to allow for better weight bearing. The ischial seat should not be placed diagonally across the posteromedial apex as it was in the old conventional A/K prosthesis but rather placed slightly lateral so that it will not constrict the hamstring muscles at the posteromedial angle. This area should be channeled so that the hamstrings are free and the amputee, on sitting, does not experience a burning pain due to stretching of these muscles. It is strictly an individual fit; and, in some patients with well developed muscles in this region, it may be necessary to eliminate completely the ischial seat.

In general, the ischial seat must be carefully shaped for the ischial tuberosity to sit on its inner edge with the rest of the posterior border of the rim of the socket conforming to the contour of the gluteus muscle against which it should be abutted. The lateral border should fit snugly over the trochanter to prevent the socket from slipping medially from the ischial tuberosity and the lateral wall of the socket should fit closely for the greater part of the length of the stump. The lateral border at the greater trochanter is the highest point of the rim, sloping down in front to the anteromedial angle at the adductor region. The anterior border should not be too tight, especially over the femoral vessels. The anteromedial angle is the most important part of the socket and, at the same time, the most difficult to fit. Any faults in this will result in an abnormal gait pattern. The apex, formed by the anterior and medial sides of the socket, should be channeled out from above downwards to form a groove for the adductor tendons and it is important that this groove be the right size and shape. If it is too tight, it will cause pain on weight bearing and if too large, will cause a decrease in control of the prosthesis. The medial border, which is often not fitted correctly, should fit high into the crotch so that no soft tissues are bulging over the rim. If the socket is constructed correctly, it will provide for the individual variations and characteristics of the stump and will fit it in one position only. If any adjustments in alignment are necessary, they must be done below the level of the socket.

Since the angles of declination and inclination of the lower limb vary with the height and build of the individual, the prosthesis must be adapted to the anatomic structure of the amputee. Because of the disturbed muscular and mechanical balance caused by amputations, the A/K stump assumes a position of rest that does not coincide with the normal extremity. This position has to be compensated for by proper alignment of the prosthesis.

In the frontal plane, the normal lower extremity exhibits a mechanical axis around which certain movements take place. This axis differs from the diaphysial and anatomic axes. In an average person, who is standing with the body weight distributed evenly on both feet, the load

line and the mechanical axis pass through the center of the head of the femur, the center of the knee, and slightly toward the medial side of the os calcis. This relation is disturbed in one-legged standing and the load line passes just medial to the head of the femur. In lower extremity amputations, this shift is even greater and the load line is found anywhere between the head of the femur and the symphysis pubis. This shift is partly, but not entirely, corrected by the prosthesis. It is caused by a deficit in certain stabilizing muscles of the stump and the difference in weight produced by the prosthesis as compared with the sound limb. In the saggital plane, the posterior shift of the center of gravity results in the plumb line falling behind the hip joint, passing in front of the knee joint, and falling in front of the ankle joint and through the center of the base of support.

The majority of A/K amputees are provided with an ischial weight bearing prosthesis. Consequently, during the stance or weight bearing phase, the superincumbent body load balances not on the hip joint but on the ischial tuberosity. Because the center of gravity falls in front of this tuberosity, the force of gravity tends to tilt the pelvis forward and the amputee attempts to compensate for this imbalance by shifting the superincumbent load (the trunk and upper extremities) backward so that the center of gravity comes over the ischial tuberosity. A mild degree of posterior shift of the trunk is not objectionable, but the amputee should not be permitted to walk with an excessive increase in lumbar lordosis or tilt the trunk backward too much. To correct this biophysically displaced support, it is necessary for the amputee to have about five degrees of hyperextension in the hip joint. If this is not present, then the socket should be so aligned that the weight bearing support through the ischial tuberosity will be positioned five degrees less than full range of motion. This flexed position of the socket provides the ischial tuberosity with a better and larger weight bearing surface which is not imbedded so deeply in muscles. The normal declination of the femur in this position should be taken into account. In the sagittal plane the femoral shaft, bowing anteriorly, has a declination angle of approximately ten degrees and this convexity should be incorporated in the socket and not in the trochanteric joint. It is important not to exceed this degree of bowing, especially in short stumps, which usually have a tendency to project forward excessively.

2. Trochanteric Joint and Pelvic Belt

The main axis of the hip joint, around which flexion and extension take place, is through the center of the acetabulum which runs from the anterolateral to the posteromedial direction of the pelvis. This is the important axis for the alignment of the trochanteric joint of a prosthesis. It pierces the outer surface of the thigh anterior to and at the level of the tip of the greater trochanter. The trochanteric joint should be so placed that it coincides with the axis of this principal movement.

Buchanan and Robinson believe that the most favorable position for the trochanteric joint is one-half inch anterior to the greater trochanter (or 1¼ inches to 1¾ inches anterior to the middle of the greater trochanter). This results in straightforward flexion as compared with flexion complicated by considerable abduction when the joint is placed over the trochanter and by adduction when it is placed three-quarters of an inch anterior to the trochanter. In a stump with external rotation, the artificial joint may have to be placed closer to or over the trochanter to accommodate this deviation. It is evident that considerable adjustment must be made in the position of the trochanteric joint, within rather narrow limits, to compensate for varying degrees of flexion, abduction, and external rotation of the stump. The plane of the trochanteric joint should be at right angles to the axis and while this is often overlooked in alignment, it has considerable influence on motion. If it is incorrectly placed, it will cause severe strain, stump fatigue, and abnormal gait.

Usually, a standard trochanteric joint allows only flexion and extension, thus limiting considerably the normal motion of the hip joint by eliminating abduction-adduction and rotary movements which are essential in normal locomotion. Though the amputee, by using his entire pelvis, compensates to a certain degree for this limitation, he also puts a great deal of stress and mechanical strain on the trochanteric joint. There are available trochanteric joints which also permit abduction and adduction, and attempts have been made to provide artificial joints which allow rotation; however, the latter seem to be unsatisfactory from a mechanical standpoint.

The pelvic belt, to which the trochanteric joint is attached, should be worn between the crest of the ilium and the tip of the trochanter and should run horizontally around the body, passing between the crest of the ilium and the tip of the trochanter on the sound side. The metal por-

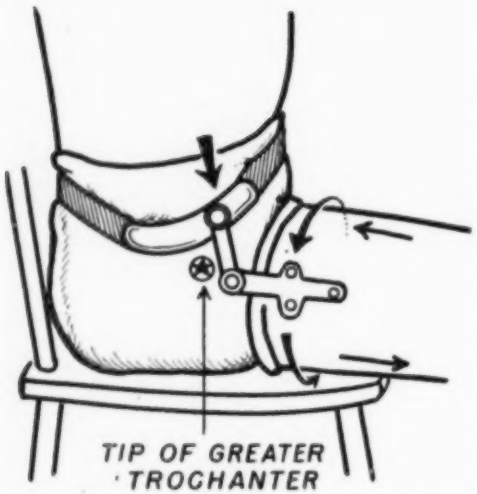

Figure 3. Rotation of prosthesis caused by misplaced trochanteric joint.

tion of the belt should be curved to fit accurately the shape of the body and should be placed horizontally along the pelvic belt. A common fault found here is that the metal piece does not fit accurately or the bar from the trochanteric joint does not bend to the contour of the body; and, consequently, the metal piece stands away at one end, causing undue pressure on the opposite border and malalignment of the prosthesis. If, for some reason, the amputee cannot wear the pelvic belt horizontally, then the metal piece should be aligned accordingly so that it will provide proper motion and stability in the hip. If the pelvic band becomes too tight, it will result in the upper border being drawn inward and the prosthesis will become abducted. As a general rule, the bar connecting the trochanteric joint and the metal piece of the pelvic belt should run almost vertically showing very slight forward flexion.

If the trochanteric joint has been placed in the proper axis, then there will be little or no movement of the pelvic belt, except for that occurring from the limited motion permitted. If the trochanteric joint has been placed inaccurately, then, on flexion of the extremity, there will be a considerable downward drag on the pelvic belt, and the upper part of the socket will cut into the groin of the stump while its posterior part will be pushed downward. In other words, an abnormal rotation of the socket will occur on the trochanteric joint (Figure 3).

3. The Knee Joint

In the frontal plane, the diaphysial axis of the shaft of the femur is markedly oblique, being directed downwards and inwards, whereas the tibial shaft axis is almost vertical. The two axes meet at the center of the knee joint and form an angle of about 7° to 10°, thus producing a physiological knock-knee which should be incorporated in the prosthesis. Failure to provide this causes pronounced lateral swaying on walking because the center of gravity is displaced excessively over the axis of the leg and foot to maintain proper support balance.

The femur is placed forward on the leg and the transverse axis of the knee articulation passes approximately through the junction of the anterior two-thirds and the posterior third of the joint. Similarly, the thigh part of the prosthesis should be placed anterior to the shin piece.

The transverse axis of the knee, which for practical purposes is in the frontal plane, is not a fixed point; but, because of the shape of the femoral condyles, it moves posteriorly as the knee is flexed. This gives the knee a certain amount of gliding motion and rotation. To secure a properly functioning artificial knee joint, it is necessary to place these hinges opposite the midpoint of the femoral condyles. The best method of determining this point for the A/K amputee is to identify, on the sound extremity, the prominences where the collateral ligaments are attached to the femur. If the location is chosen properly, then there will be little, if any, motion in this spot when the patient flexes or extends the knee. This level should be determined and the knee bolt placed accordingly. As a general rule, this bolt should be placed in the frontal plane parallel to the ground, slightly posterior to the load line, and at right angles to the line of progression. If it is not placed accurately, then there will be found a whip of the leg, either inwardly or outwardly, depending on the position of the bolt. The determination of this position should be made individually because some amputees, who have certain muscle imbalance may require this bolt to be placed at a different angle to secure a good gait.

The knee bolt should be placed only slightly posterior to the load line so that the center of gravity falls in front of the joint. This position of the bolt is particularly applicable to young and well developed persons who are to use their prostheses a great deal in walking. It gives sufficient security against unexpected buckling, yet permits an easy and efficient gait. If more stability is required, as in elderly people or in pa-

tients having other disabilities, then the knee bolt should be placed more posteriorly, putting the knee joint into slight hyperextension on weight bearing. This will make an excellent stable "standing" leg, but will not produce a smooth gait and will make locomotion more difficult and fatiguing.

The hyperextension of the artificial knee is controlled by back check regulators or ligaments, which are made of various materials and have many different designs. Whichever type is used, it should usually be set so that the thigh piece is almost vertical with the leg, providing only slight hyperextension and in addition, the back check should be synchronized with the size of heel and instep bumpers, which control the ankle movements.

4. The Ankle Joint and the Foot

The ankle joint should be set forward toward the center, preferably at the posterior border of the middle third of the foot and at the junction of the anterior and middle third of the A-P diameter of the leg at the ankle. In the human ankle joint, the transverse axis runs obliquely between the malleoli from the posterolateral side to the anteromedial aspect of the foot. This should be provided, to some extent, in the prosthetic foot by placing the axis at an appropriate angle so that when the ankle bolt is attached to the shin piece it will provide a certain amount of lateral rotation. The alignment of the foot in this position, combined with the placement of the knee bolt near the load line, will eliminate excessive heel rise and high pelvic elevation on walking.

The foot should have about the same amount of toe-out as the sound foot. This toe-out should be adjusted to the usual walking habits of the amputee because observations show that in a normal individual each limb has its own peculiar amount of rotation. Provision of such toe-out will facilitate gait training as it will not require the amputee to learn a new walking pattern which is foreign to his life-long habits. Usually, the amount of toe-out will be found to be within 5° to 20° of external rotation. The degree of toe-out for each person can be roughly estimated by comparing the position of the stump as it hangs dependent and relaxed and the usual position assumed by the normal extremity at rest. The difference in the degree of rotation will indicate roughly the difference in the toe-outs that the individual normally had in his walking pattern.

The artificial foot is set in the equinus position to accommodate the average position of the foot caused by the wearing of a heel on the shoe. It should provide for weight bearing on the total plantar surface. Because of limited motion provided by most types of ankle joints with only dorsiflexion and plantar flexion, full plantar bearing can be obtained only in one position, i.e., in the line of progression. This limited motion in the ankle secures stability of the prosthetic foot, but it creates difficulty in balancing. To obtain easier balancing, some limb makers align the foot and the leg so that the foot is placed in a slightly everted position. In such case, the amputee will have a less firm purchase on the ground when he maintains his body weight on both feet. The provision for this must be minimal; otherwise, it will interfere with good gait.

There are artificial ankle joints which also provide lateral motion. However, these require a greater sense of balance, good muscular coordination, and more training on the part of the amputee. Although they are excellent on level walking they cause a severe degree of instability on rough ground. Mechanically, they are weaker and often become poorly aligned.

The range of motion in the standard artificial ankle joint is controlled by two sets of rubber bumpers, one placed posteriorly in the heel, the other anteriorly in the instep (Figure 4). The

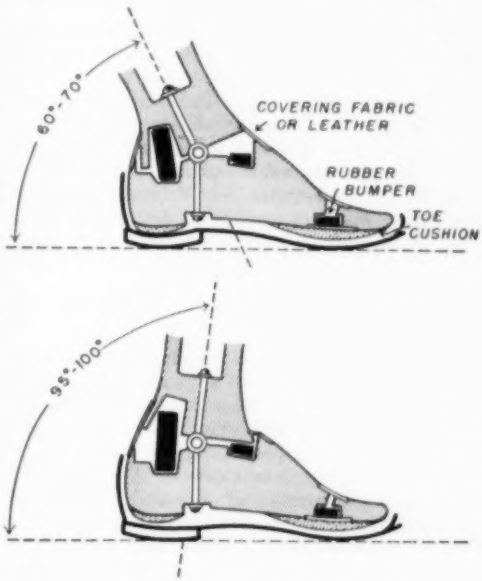

Figure 4. Mode and range of action of the bumpers of a prosthetic foot.

degree of motion permitted should be adjusted individually, depending on the physical condition of the amputee, the length of his average step, and the cadence of his gait. For the slow walker, the dorsiflexion should be more liberal; for the fast walker, the range can be more limited. If there is too much dorsiflexion, the amputee will walk as a person with paralysis of the calf muscles. The instep bumper should be synchronized with the knee motion to obtain an optimal alignment for if this instep bumper is not firm enough, the amputee will have a jerky gait. The heel bumper should allow 20° to 30° of plantar flexion under weight bearing.

Aside from weight bearing, another important function of the foot is to provide propulsion during gait. This is accomplished in the normal foot by a push-off of the toes, the motion taking place in the metatarsophalangeal joints. In most prosthetic feet, this is provided in the toe or metatarsal joint. The axis of this joint does not necessarily correspond with that of the normal foot but runs diagonally across from front to back, from the inner side of the foot outward, at an angle of about 82° from the long axis of the foot. The axis of this joint should be placed accurately to obtain a smooth gait. If the angle is wrong, then rotation, mostly inward, of the prosthesis will occur during push-off and will throw the amputee off lateral balance. The actual propulsion is supplied by a rubber "toe" bumper incorporated in this joint. When this toe bumper is too small or worn out, then the foot will not roll over smoothly and will have an awkward gait. In addition, the toe of the shoe will usually stand up as if the toes were in hyperextension. It must be realized that the push-off obtained by the prosthetic foot will never duplicate the normal one because it lacks the intrinsic function of the foot.

THE A/K SUCTION SOCKET PROSTHESIS

The suction socket prosthesis eliminates use of the trochanteric joint and suspension apparatus. This results in much freer motion and better control of the limb. The axial alignment of the prosthesis is the same as for the conventional type. The socket has more of a rectangular shape than a conventional one; and it should be modified to conform to the anatomical configuration of the individual stump. This close fit is essential because the prosthesis is used on physiological bases and is activated and controlled by the remaining muscles of the stump. It should fit snugly to maintain an airtight seal but should not restrict the action of these muscles or interfere with circulation. When fitted properly, there is no slipping of the skin relative to the wall of the socket. The remainder of the femur moves within the soft tissues of the stump.

The superior plane of the socket slopes from front to back and from lateral to medial side (Figure 5). The medial border of the socket should extend to a level just below the ischial tuberosity. It should fit well into the crotch, permitting no bulging of tissue above it. In some patients, this area may be very sensitive to pressure, and it may be hard or even impossible to fit them with a socket that is airtight. However, with the more recent developments in suction socket research, it appears that, by providing a more laterally placed ischial seat and an adducted position for the stump in the prosthesis, the vertical pressure in the crotch, causing pain in the region of the stretched adductor tendons or on the pubic ramus, is markedly relieved. This is further relieved by the shape of the socket, which has a diminished A-P diameter, thus widening it in the lateral dimensions. The height and shape of this border varies with almost every patient and depends on the condition and activity of the adductor muscles. If these muscles are atrophied and are able to stand pressure, then this border may be made higher. The medial wall is essentially vertical. The anteromedial apex is the most important area to fit. It should be channeled for the adductor muscles; the groove should be narrow enough to maintain the air seal but wide enough to permit free action of these muscles. Crowding or too tight a fit will cause pain and will tend to rotate the foot outward at the heel strike. Tightness may also produce skin irritation.

The anterior wall should avoid pressure over the femoral triangle as this may result in impaired circulation and edema of the stump. At present, there is a tendency to use a higher anterior rim on the socket as it is practiced in Germany, thus providing for a firmer contact between the stump and the socket in the region of the greater trochanter. With the rim extending higher into the groin, it is necessary to ascertain that excessive pressure is not exerted in this region. It is also important to prevent this high border, especially at the anterior medial apex, from cutting in excessively during sitting. A high anterior border should always be used with short stumps. The purpose is a better control of the extremity during the swing phase and more adequate stabilization of the hip during

weight bearing. This is especially true when it is associated with the use of a Silesian bandage.

The lateral border is the highest part of the prosthesis, and should extend to the level of the base of the greater trochanter. There are divergent opinions on this subject. Some maintain that this border should extend to the tip of the greater trochanter and thus provide good stabilization. However, if this level is too high, it will interfere with free motion at the hip. The proper fitting of the lateral wall is important because on this depends largely the type of gait pattern the amputee will have. If this lateral wall is fitted loosely, then there will be poor lateral stabilization of the prosthesis with a resultant excessive sidesway of the trunk. Therefore, it is essential that this lateral wall fit snugly for the entire length of an average stump. It should slope downward and inward. Such fit causes a certain amount of pressure on the abductor muscles of the stump, which have a tendency to assume an abducted position as a result of muscle imbalance created by the amputation. If, in fitting, the pressure is uniformly diffused over a wide area, it will not produce any discomfort, especially if the wall is built slightly flattened. The increased stabilization of the prosthesis due to better control of the abductor muscles will permit the other muscles of the stump, especially the adductors, to act more effectively. It will eliminate, to a large degree, the tendency of the pelvis to drop toward the normal side and will permit the amputee to walk with a narrower base.

In the older pattern for suction socket, there was a protuberance on the inside of the medial wall, posterior to the area for the trochanter. This was supposed to better stabilize the prosthesis, especially in short stumps; and it was to prevent this ischial tuberosity from slipping off the ischial seat. With the more recently developed new pattern and the snug fit of the lateral wall, this protuberance is no longer provided. Occasionally, it may be useful in short stumps for controlling excessive rotation.

The posterior part of the rim of the socket should expand into an ischial seat, which is the main weight bearing area. There is much controversy on the exact placement of this seat. In the older patterns, it was placed diagonally across the posteromedial apex, but recent investigations reveal that this seat should be placed more laterally on this border, providing a channel for the hamstring muscles in the apical area. This size of the ischial seat varies and it must be so adjusted to each person that no slipping of the ischial tuberosity occurs when it is bearing

Figure 5. The superior plane of the socket slopes from front to back and from lateral to medial side.

weight on the inner edge of the seat. Anterior slipping is prevented by the high anterior wall being slightly flattened in its upper third, and the proper adjustment of the anteroposterior diameter of the socket. Lateral sliding is controlled by the close fit of the lateral wall. Because of these factors which prevent slipping, the ischial seat does not need to be large. The increased lateral diameter of the socket permits a larger weight bearing area for the gluteal muscles. This border should conform with the configuration of these muscles without any apparent relief. If the shape of the socket is faulty or the ischial seat is too wide or placed incorrectly, slipping of the ischial tuberosity may occur, especially on sitting, and result in a jabbing sensation or marked pain.

In general, the suction socket should be quite snug, but not tight, with the pressure distributed evenly over the entire stump. To test the efficacy of the fit, an attempt should be made to pull the prosthesis off the stump when the expulsion valve is out. It can be done only with difficulty

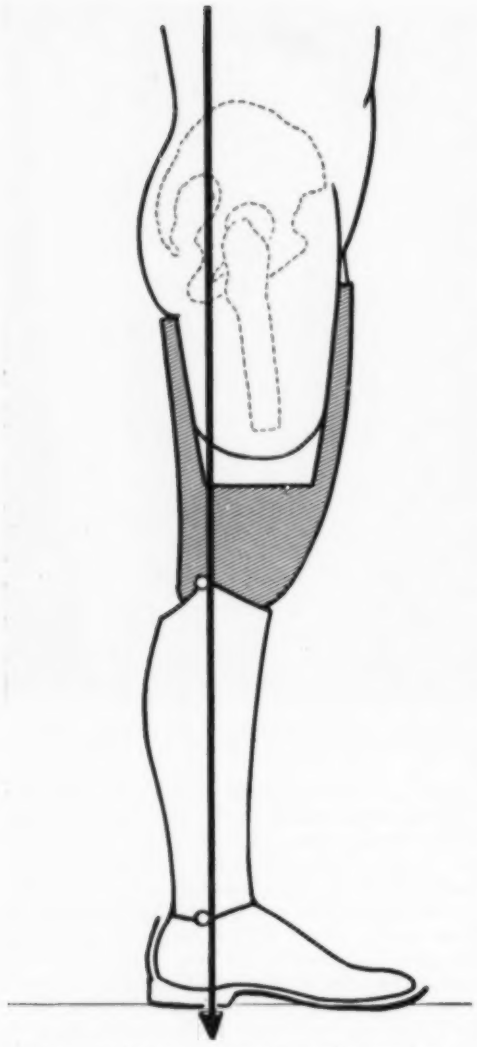

Figure 6. Alignment of suction socket prosthesis with positional flexion of the socket with regard to the load line.

if the amputee tenses his muscles. The prosthesis should not fall off when the muscles are relaxed, yet one should be able to remove it with little force. When these requirements are provided, the fit of the prosthesis is correct for it gives sufficient expansion space to the muscles and will not embarrass circulation. Uneven fit results in localized pressure with pain and other complications. If the fit is too tight in the middle or upper parts of the socket, swelling or edema occurs at the end of the stump.

The suction socket should be aligned in the same way as the conventional prosthesis. Because of the elimination of the trochanteric joints, the main longitudinal axis is transferred more posteriorly and becomes identical with the load line through the ischial tuberosity. To balance the prosthesis correctly and to provide for the greatest static stability, the ischial tuberosity has to be brought forward over the foot support. This will assure stability but will create a certain amount of interference with gait. To correct this, it is essential that the stump be placed in such a manner that it will have at least 5°-10° of hyperextension. This is accomplished by aligning the socket in 5°-10° of positional flexion (Figure 6). It is interesting to note that in most cases the minimum degree of positional flexion corresponds to the angle created by a line connecting the ischial tuberosity with the center of the knee axis and a plumb line through the hip joint; it is 7° on the average. This will provide sufficient extension at the knee and will give adequate stability with good gait pattern.

In an amputee with well developed hamstring muscles, it is essential to align the socket in positional flexion because, otherwise, during push-off, he will force his ischial tuberosity off the seat as he extends his stump causing excessive pressure against the anterior part of the socket. This is one cause of persistent reddening of the end of the stump and edema. Another complication is pain in the hamstring area. Positional flexion will alleviate this difficulty to a large degree.

1. The Silesian Bandage

Occasionally, the suction socket prosthesis may be difficult to stabilize during the stance phase or to control during the swing phase. In such cases, the Silesian bandage may be used. In this country, it is seldom prescribed, but in Germany, most suction sockets are provided with a Silesian bandage. With this band, the fit is not as snug nor as correct as it would be without it, but it prevents the stump from slipping off the socket during sitting, gives the stump better control, and increases the sense of security of the amputee. It may be of great value in some stumps that change their size and dimensions quite frequently and apparently without much cause. Here the Silesian bandage will secure the hold of the prosthesis during apparent shrinkage. The Silesian bandage consists of a horseshoe-shaped metal bar, which is fastened to the

inside of the socket so that it encircles the tip of the greater trochanter (Figure 7). If it is placed at the wrong level, it will cause rotation of the prosthesis. The posterior arch of this bar should not impinge on the trochanter. The tip of the trochanter should be within the upper part of this bow. From the posterior arch of this horseshoe-shaped bar, a belt, one and one-half inches wide, encircles the body in the same fashion as a pelvic band of the conventional prosthesis. A metal spring steel is often incorporated into this band as it circles around the sound side to provide counter-action and to hold the belt in place. The band is attached to the anteromedial side of the prosthesis at about the level of fossa ovalis. The lower the position of this attachment, the more adduction of the prosthesis occurs, and vice versa. The bar of the Silesian bandage does in fact extend the lateral wall of the prosthesis much higher and provides greater stability and control.

2. The Knee Joint

The general alignment of the knee joint is the same as in the conventional prosthesis. It must be adapted to the requirements of the amputee, his age, weight, occupation, and the prevailing terrain on which he is going to use the prosthesis.* The amputee provided with a suction socket has better developed muscles with more power than the wearer of a conventional prosthesis; therefore, it is not necessary to provide for excessive involuntary stability. For that reason, the knee axis does not need to be placed too far posterior to the load line. In this way, the maximum amount of voluntary control of the knee is provided, resulting in a smoother gait and greater ease in negotiating stairs and slopes.

If the knee is not aligned correctly, then the amputee may show a whip of the knee in the swinging phase, which is associated with rotation of the leg as the heel strikes the walking surface. This is usually due to wrong angular alignment of the knee axis in the frontal plane; however, too much or too little provision of physiological knock-knee may produce the same phenomenon.

3. The Ankle Joint and Foot

The ankle point commonly used is the single axis conventional type, located and aligned in the same fashion as in the conventional prosthesis, but because control depends only on muscular action, care should be exercised in determining the stiffness of the ankle joint, as well as the toe, bumpers. As a general rule, the instep bumper should be quite stiff as this will result in a more secure knee and a smoother gait. The foot is individually aligned to provide for the usual toe-out of the amputee.

* We found that farmers cannot use suction sockets while driving a tractor. The vibration of the tractor literally forces the prosthesis off the stump.

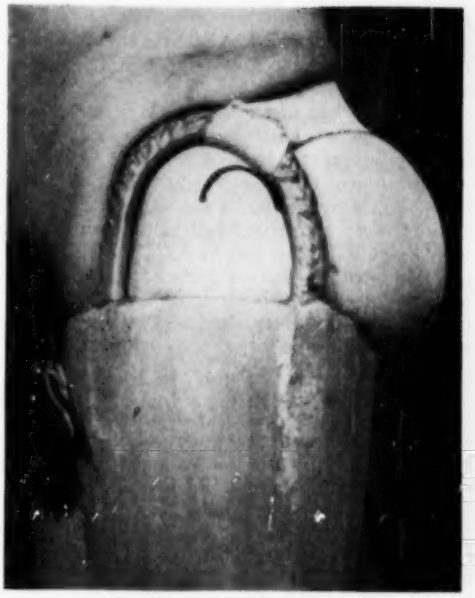

Figure 7. Silesian bandage. The horseshoe bar is placed incorrectly in relation to the tip of the greater trochanter (outlined). It is also wrongly attached from the outside of the socket.

FEMORAL END-BEARING PROSTHESIS

Only stumps resulting from amputations through or near the knee joint may be fitted with a femoral end-bearing prosthesis. There is still a good deal of controversy as to the value of an end-bearing stump and its ultimate fate. Craft believes that, within five years, over seventy-five per cent of these cases are converted to ischial bearing prostheses while Larmon states that end-bearing stumps are preferred when considerable walking and standing is required. According to Steindler complete end-bearing is most valuable when it can be secured. The Canadian School, which seems to favor the Gritti-Stokes amputation above all other types, considers that there is no comparison between the efficiency of the end-bearing and the base-bearing stump, the former being the more satisfactory. Kessler

feels that there is no excuse for not performing this type of operation, but believes that not many limb makers are able to provide an appropriately fitted prosthesis.

The advantage of an end-bearing stump is the improved sense of balance and gait because the amputee seems to have a better idea of the whereabouts of the ground, which is provided by the weight bearing end of the stump. To obtain a satisfactory end-bearing stump, the end of the bone must be broad and smooth, the scar must be away from the bearing surface, the soft tissues over the end must be well nourished and accustomed to pressure, and there must be no points of tenderness.

1. The Socket

The end-bearing stump is usually fitted with a molded leather socket, although some limb makers prefer a combination of wood and leather. In either case, the leather is molded over a slightly altered plaster model and great skill in limb fitting must be displayed to make these alterations. The end of the plaster model has to be built up to allow room for the end pads. If the condyles of the femur are present on the stump, these points are also built up. The cross section of the socket at the end-bearing surface should be almost circular.

It is an established fact that the remaining part of the femur rotates in the socket regardless of the type of prosthesis used. In the case of an end-bearing prosthesis, the hip is usually stabilized by a trochanteric hinge; while, on weight bearing, the leg and foot are stabilized by purchase against the walking surface. The weak point where rotation must take place is the end of the stump. It does rotate, first laterally then medially, on every step. This torque creates considerable friction at the end. If this is combined with a poorly fitted socket, then the sides of the stump are impinged on the sides of the socket, resulting in constant microtrauma. This is especially true when a roughly oval stump end is fitted with a snug socket. The amount of rotation at the end of the stump is much greater than it would appear at first. Our rough estimate indicates it to be about 30°. We believe that the lack of sufficient relief to accommodate this rotation is the main cause of complications such as chafing, tenderness or actual breakdown of the stump. It is also our belief that the socket at the level of the weight bearing surface should be circular (Figure 8). This circular socket is the most important factor in the excellent results obtained by the Rogers' method of disarticulation at the knee. The stump, from such procedure, is almost round, and the socket into which it is fitted has no flat sides to cause microtrauma at each step.

Some limb makers fit the leather socket for lateral bearing so that it has considerable purchase against the sides. This type of fit has a tendency to cause pressure, atrophy of the muscles, and may interfere with circulation. Some limb makers even attempt to combine end-bearing with ischial-bearing. This, from an academic standpoint, can be provided in theory, but cannot be accomplished in practice because it is almost impossible to distribute the degree of pressure so that both places will be bearing weight at the same time. What usually happens is that the prosthesis becomes ischial-bearing for practical purposes. The socket is aligned according to the same principle as the socket of the A/K prosthesis; however, because of the long lever of the stump, the angle of declination must approach that of the normal limb. This socket does not have to be aligned in positional flexion.

2. Suspension and Harnessing

The socket is usually connected through a trochanteric joint to a pelvic band, both of which should be aligned as in the conventional A/K prosthesis. Some amputees have such excellent control of the prosthesis that they do not require any suspension or only slight suspension. In the last case, the prosthesis is suspended by webbing or leather straps attached to a belt which will not interfere with normal motion of the hip, yet will provide sufficient protection against accidental slipping off of the prosthesis.

3. The Knee Hinges

The knee hinges are of the side joint type, as used in the B/K prosthesis. They should be aligned in the same fashion as the artificial knee bolt of the A/K prosthesis, i.e., in the three dimensional planes horizontal to the ground, in the frontal plane, and at right angles to the line of progression. They are placed always posterior to the load line. The hinges should have appropriate stops to prevent genu recurvatum. In addition, there is usually a simple adjustable leather thong attached posteriorly, which further controls overextension. An elastic strap is often used in the front. It is attached to the upper end of the leg and to the belt or upper end of the socket. The function of this strap is to assist in knee extension as it initiates the action of the quadriceps muscle.

4. The Ankle and Foot

The leg, the ankle assembly, and the foot are fitted and aligned as in the conventional A/K prosthesis.

THE B/K PROSTHESIS

At the present time, there exists a controversy as to how a B/K prosthesis should be fitted and suspended. In this country, the majority of B/K stumps are fitted with a combination of lateral and base-bearing sockets. With these, the body weight is being carried on some bony surface that is neither extensive nor prominent. From a biophysical standpoint, such weight bearing is unsound and often produces severe complications. This fact has caused a gradual change in fitting habits; and, at the present time, some of the outstanding authorities in this country believe that all B/K amputees should be fitted with prostheses in such a way that the grater part, if not all, of the weight is borne upon the ischial tuberosity, or the gluteal muscles.

1. The Socket

As a general rule, a rigid socket is preferred because when properly fitted it will distribute the pressures uniformly over the surface of the stump in the places where the stump can comfortably bear weight. Such a socket will maintain the exact shape indefinitely. This is important because a socket made of a soft material, such as leather, alters with wear and as a result, the weight is shifted to places that cannot tolerate it. In a well constructed socket, the weight is borne on the expanding front and sides of the upper end of the tibia. Frequently, the tibia expands very little, and the stump has sides that are almost parallel. The socket should be fitted to take advantage of every available surface that will tolerate weight. Even with a perfect fit, in the majority of cases only a part of the weight is borne by the socket, the remaining part being taken by the thigh corset.

The socket should be fitted to conform to the size and shape of the stump. As a rule, the general shape of the socket is triangular but it should be rounded across the back. The greatest part of the weight should be borne on the anteromedial aspect of the tibial tuberosity, on the sloping and wide medial surface of the tibia below it, the lateral surface in front of the fibula, and the patellar tendon. No pressure should be exerted at the margin of the tibial plateau, especially in the region of the insertion of the joint capsule. Excessive pressure should be avoided on

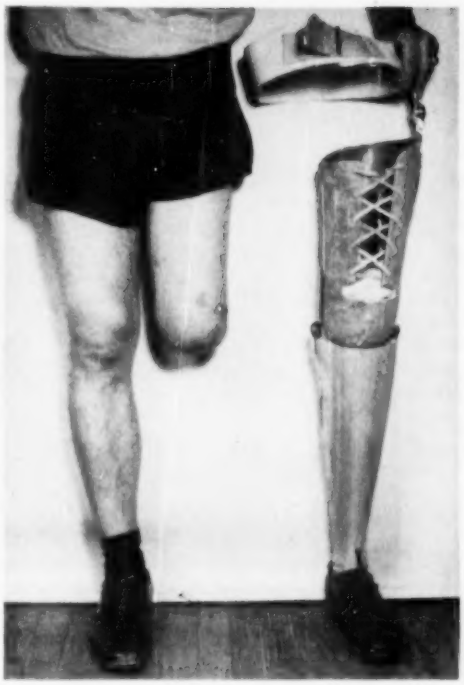

Figure 8. End-bearing stump and prosthesis following Rogers disarticulation procedure. Note the circular shape of the socket.

the tubercle, the sharp crest and lateral surface of the tibia, and on the head of the fibula. In addition, no pressure should be put on the peroneal nerve or the vascular parts of the stump in the popliteal space since pressure in this area will interfere with circulation. One of the commonest faults in fitting a B/K socket is excessive pressure at the rim. When the amputee is standing, the anterior and posterior borders of the socket should be on the same level, i.e., the anterior border of the socket should be about one-fourth inch below the inferior border of the patella, and the posterior border should extend well into the popliteal space, leaving adequate relief for the hamstring tendons. The height of this border is correct if the amputee can fully flex the knee and no bulging of tissues occurs.

Most of the B/K stumps present a longitudinal axis which exhibits two curves; the upper one is toward the outside, the lower is directed medially. These have to be provided in the socket so that the proper load line is maintained. As a general rule, no weight bearing should be permitted on

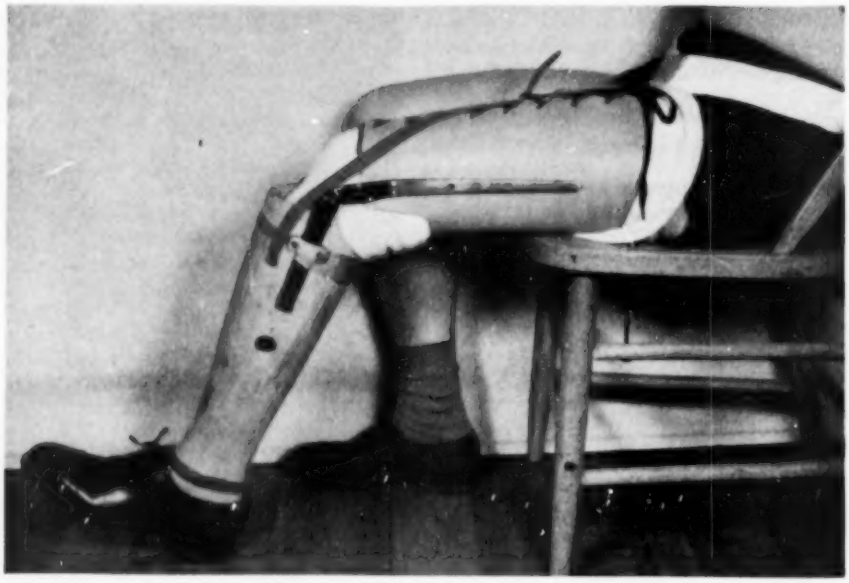

Figure 9. Malaligned knee hinges in a socket with a low posterior brim, causing a gap in front and bulging in the popliteal space. The thigh corset is too long.

the end of the stump. If there is a flexion deformity, the socket has to be aligned in such a manner as to accommodate this, and the axis of the rest of the prosthesis must be changed to align it properly for weight bearing.

2. The Knee Joints

The side knee joints are of greatest importance in allowing freedom of flexion without pressure in the popliteal space. They should be placed just posterior to the load line at the level of the transverse axis of the natural joint. This place can be found as described previously under conventional A/K prosthesis. The hinges should be parallel to each other in the sagittal plane. They should be placed so that they are an equal distance from the walking surface. If placed correctly, they will not move with relation to the stump on locomotion provided the rest of the prosthesis is aligned correctly. If they are placed too high, then they will interfere with flexion of the knee, causing pinching in the popliteal space; and they will force the anterior aspect of the stump against the rim of the socket, causing pain. If the joints are set too low, they will pull down and rotate the thigh corset, causing constriction in the popliteal space on sitting. In addition, there will be an open space in front between the socket and the stump. If the joints are placed too far back, during sitting they will cause excessive pressure on the anterior aspects of the thigh and the stump, and faulty gait on locomotion (Figure 9).

3. The Thigh Corset

The length of the thigh corset will depend on the type of bearing the prosthesis is to provide. We believe that the thigh corset should extend the whole length of the thigh and end in an ischial or gluteal bearing expansion. With a lateral and base-bearing prosthesis, the thigh corset supports considerable weight. If such corset is examined, it is found to represent an inverted cone into which the thigh fits as a plug. This not only causes undue pressure on the thigh muscles, but also interferes with circulation. As a result, one invariably sees a marked degree of atrophy of these muscles, which provide the principal locomotive force to the prosthesis. Consequently, there is loss of stability and endurance. The lower anterior border of the corset should begin just above the patella. The lower posterior border should be cut away two or three inches so as not to interfere with flexion.

The ischial expansion or seat of the corset is best when made of several thicknesses of celastic,

which is appropriately bevelled and incorporated between two layers of leather. A ring or turn-out expansion at the upper border of the corset is not desirable and contraindicated because it interferes with the sitting position and shows through the clothing.

The upright bars connecting the knee hinges and the corset must be aligned so that they allow for the normal inclination and declination angles of the thigh and provide for the physiological knock-knee that is always present in the B/K stump. If this is not provided, the socket will be held considerably straighter than the stump and will result in pressure at the medial border of the rim and a "contrecoup" pressure at the lateral side of the end of the stump.

To test the alignment of the corset, the patient should stand in a comfortable position on the prosthesis while the corset is bent back out of the way. Then the corset is brought up into contact with the thigh, and the angle of the upright bars is noted. These bars should be parallel to the respective sides of the thigh.

The corset, in the back, is connected with the posterior aspect of the leg by a leather thong. Its primary duty is to prevent hyperextension. It should be aligned correctly because if it is not attached properly it will pull to one side of the extremity and cause a certain amount of rotation of the socket. The leather strap should have free play through the eyelets; otherwise, it will exert more pull on one side than on the other.

4. The Ankle Joint and the Foot

The ankle joint and the foot are constructed and aligned as in an A/K conventional prosthesis; however, the degree of dorsiflexion in the ankle should be adjusted more carefully, because insufficient motion may cause pain in the stump at the level of the anterior border of the brim. This results from mechanical interference due to friction at the brim because the amputee on locomotion must exert more pressure on the socket of the prosthesis to overcome this increased ankle resistance. The dorsiflexion permitted in each prosthesis should be adjusted individually.

SUMMARY

The alignment and fitting of the four major types of prostheses have been presented. It is believed that the physician and the therapist, who are responsible for the rehabilitation of the patient, should know the fundamentals of this art so that they can make appropriate observations and logical recommendations to the limb maker or correct faults in locomotion before faulty patterns are established.

The photographs were taken by Mr. Homer L. Jones and the illustrations were made by Miss Ann Marshall — to whom the author is indebted.

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Our Book Reviewers for June

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A Realistic Approach to Rehabilitation

Samuel G. Feuer, M.D., Murray Chrystal, M.A., and Harriet Kaufman, B.A.

Physical Medicine and Rehabilitation b virtue of the type of treatment given brings the physiatrists and therapists into more direct contact with the patient than any other specialty in medicine. This relationship, if used wisely, can bridge the gap that exists between the definitive physical measures employed and the socio-economic and psychogenic problems affecting the patient. The importance of understanding these intrinsic problems as they affect the patient cannot be overestimated. Often it is the difference between obtaining a fair degree of rehabilitation and being burdened with a patient who is helpless both physically and psychologically. A patient with a chronic disability who does not wish to return to his community will not respond to treatment with sufficient success to be able to leave an institution in spite of all the therapies that might be ordered. As an example, we cite two cases: one, an amputee who had been in and out of various hospitals for kindred ailments since 1930; he would not succeed in using his prosthesis so that he might walk again and was finally institutionalized permanently in a veterans' home; the other, a person with the same type of amputation, who had been placed on the rehabilitation program at approximately the same time, succeeded in walking well enough to be able to return to his job. Investigation into the background of the first patient revealed that he had not held a job for many years, had lost contact with his family, and had not lived in any one community for any length of time. The second patient was a person who had led an average family existence, had held a job for many years, and who was welcomed back into his family.

In any successful rehabilitation program for a patient afflicted with a disability or chronic disease, and where institutional treatment is concerned, three criteria are necessary. First, there must be psychological acceptance of the program by the patient. Second, there must be an acceptance of such a program by the patient's family including an understanding of the physical limitations that will finally result. Third, and of tremendous significance, there is the need to educate the family group in the importance of encouraging the early return of the rehabilitated patient to his former environment. This last point is assuming greater and greater importance in the field of rehabilitation. At this institution the writers have found that within the last two years some fifty patients who had reached a point where they could return home were not able to do so because of family difficulties. This has imposed great hardship upon the instituiton in several ways. In the first place, patients are more difficult to handle when they know that hospitalization is not actually required and, secondly, it prevents the institution from admitting other patients who could benefit from the rehabilitation service.

A well integrated rehabilitation service should include not only the various therapies but also a psychologist and a medical social worker. The physiatrist when examining a patient should have at his disposal their findings so that a realistic program can be planned. This information should be available also to the therapists treating the patient.

With the preceding in mind, we would like to report a case in which some degree of rehabilitation was attained in spite of almost insurmountable difficulties that confronted the patient. Knowledge of the socio-economic and psychological factors involved in this particular case was of tremendous importance in the partial rehabilitation that resulted.

M.L. is a 61 year old white female who in 1936 sustained a cerebral embolus which resulted in a right hemiplegia. Eight months after the incident the patient was able to walk with the use of a cane but had lost all of the essential functions of the right upper extremity. In spite of this limitation, the patient was able to take care of herself and perform some of her household duties. In 1941 another embolus occurred and this necessitated an above the knee amputation of the left lower extremity. The patient remained bedridden for one year and as a result of her husband's

From the Department of Physical Medicine Rehabilitation, Jewish Sanitarium and Hospital for Chronic Diseases, Brooklyn, New York.

death was institutionalized at this hospital in the early part of 1943. From that time until June, 1950 when the rehabilitation program was instituted, the patient remained in a wheel chair but managed, with the use of her left upper extremity, to perform some of the simple activities of daily living such as wheeling herself about, and taking care of some of her toilet activities.

She was among the first ten patients to be evaluated by the physiatrist of this service. At the time of the original consultation (June, 1950) the patient explained that she was well aware of the limited aspects that rehabilitation could offer and volunteered such information as:

1. she could never leave this institution and would have to remain here for the rest of her life.
2. that she could never ambulate for real functional use.
3. she would be willing to undergo the most arduous physical regime to attain one goal, namely, the ability to walk to and from the bathroom and take care of her toilet activities independently.

Because of her great insight and determination, it was felt that she should be given a trial period of six months in which an attempt would be made to strengthen the paralytic leg and prepare the stump for a pylon. At the end of six months the patient was reevaluated and results warranted the procuring of a pylon. The patient came daily to the gymnasium and attempted to stand between the parallel bars. Five months were needed to give her a sense of balance and an ability to walk backward and forward in the parallel bars with the use of a pylon. The next big step to be considered in the program was ways and means of ambulation with the use of crutches. As has been stated previously the right upper extremity had no functional use, thus it was necessary to tie her right hand to the crutch. In spite of this great difficulty the patient was able to walk with the crutches and after a few months she could walk a distance of sixty feet.

The patient was presented then to the Orthopedic Service with the recommendation that a prosthesis be ordered for her. After long deliberation the prosthesis was procured and the ordeal of trying to walk with the prosthesis between the parallel bars was begun. Within two months the patient felt that she was ready to attempt walking outside the parallel bars with the use of a tripod cane. This was attempted and success was attained after one month. Activities were then transferred from the gymnasium to the ward with emphasis placed upon the patient's ability to go from the bed to the bathroom and back again to the bed. This took several weeks and at the present time the patient needs no assistance in performing her bathroom activities.

SUMMARY

The social, economic, and psychological factors are of important consideration in the rehabilitation of any chronically disabled patient. The consideration of these factors early in treatment affords a good gage of the eventual progress of the patient, assuming that there is room for physical improvement. A case has been presented in order to emphasize these factors. In conclusion, it is urgent for the physiatrist to recognize early in the management of any rehabilitation patient that the psychological and social factors must be considered in any realistic approach to the successful handling of a disabled individual.

Meet Our New Contributors

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The Beginning of an Amputee Program in Pusan

Ethel M. Theilmann, Major, WMSC

In the fall of 1951, I was asked by the Medical Section of US Army GHQ in Japan and Colonel Oral Bolibaugh, the Orthopedic Consultant for the Far East Command, to go to Korea to help set up a program for the rehabilitation of the Korean amputees. As there were several thousand amputees in the three ROK Army hospitals located in Pusan, there was a great need for a program of this nature. It was with a crusader's zeal dampened by many misgivings about the reception, understanding, and availability of materials that I set out. All that I knew for sure was that our government had agreed to supply materials for prostheses and trained technicians to instruct in their construction; that there was a real need for such a program to release these thousands of beds in the hospitals and that the Koreans were anxious to begin. To teach is a pleasure, to teach in face of such a need is a challenge, but to face the difficulties of language, lack of facilities, inadequately trained personnel, and very limited time tended to curb my enthusiasm. The difficulties were ever present and very real, but the friendly warmth of the Korean medical personnel and their anxiety to cooperate easily offset these problems.

The Korean amputee is just one facet of the many problems facing that war-torn country, but the experiences encountered in trying to activate a program of rehabilitation for him were typical and richly illustrative of the problems encountered when East meets West in mutual endeavor. In the first place, the existence of problems and difficulties serves only to step up activity for an American, to instigate more violent activity. The Oriental meets the same situation by a slow, relentless inching forward, a contrast that can move one to real desperation. However, this same quality keeps the Korean inching forward and therein lies the hope. Also, the Eastern code demands a smiling, agreeable understanding when dealing with the Westerner; but how heartbreaking to discover the pathetic eagerness for knowledge and the woeful lack of comprehension this mask covers.

In the short period of instruction allotted to me to present the background material, I thought to be doubly effective by preparing outlines which were translated into Korean and printed for distribution. It wasn't until the course of instruction was nearly finished that we discovered, through attempting to find some specific point, that the outline in no way coincided with what I had been saying. The translation had been done by nonmedical personnel and was completely wide of the mark in many instances. The frustrating element was that in that gathering of professional, educated people, polite customs forbade anyone to mention the discrepancy. When the generalized information had been given again, I sought the program and thus made my plans. Imagine my surprise when some fifty or sixty nurses and doctors were present instead of the few I had expected. I thought it had been a misunderstanding but found that they had understood what I wanted but just didn't want to miss anything. Such an eagerness to learn but so little knowledge of practical application.

To prepare an amputee for a prosthesis, provide it and instruct him in its use is a perfectly splendid idea, but how to select the first ones from the thousands in need. How to provide space and equipment and adequate instruction? How to keep the meager beginning going and forestall the bogging down through channels? Even with financial and technical aid from our government, this is just one phase of an enormous problem; just one more project for an overworked, understaffed medical department to oversee.

There are hopeful signs and encouragements to report. The patients themselves are eager and hopeful and quick to learn. In a land where all one's faculties are strained to earn a living, any help toward improved ability is appreciated. The patients respond well to treatment and learn to manipulate a prosthesis quickly and masterfully. In selecting one at random as a demonstration for teaching correct crutch walking, I was surprised and delighted to see him step out in a perfect four point gait on his very first try. In the several months elapsing between my visits, the program had continued and was slowly expanding. There have been several nurses selected and sent to the United States for specialized training and they are back and ready to help with the program. There is a field service school set up in Korea to train technicians in the various medical specialties which should contribute trained personnel.

The opportunity to participate in this beginning, however small, has been a valuable experience for me in understanding our Korean allies,

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and has been a basis of some very fine friendships. It has also been a lesson in appreciation, not only of the fine facilities and training we in the United States take for granted, but in the problems of performance for so much of the rest of the world. We can only hope that this beginning will continue to grow and expand until it can meet the needs of these patient people.

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Editorials

As each of us looks back on his career in physical therapy, whether this has been over many years or only a brief time, one milestone is sure to stand out among all other important events. There is little doubt that everyone remembers, for a variety of reasons, his first job. To some it may recall an experience which was a bit frightening but still pleasurable and of great value in determining later success, while to others it will be remembered only as a time of painful adjustment.

There is probably no experience in any career which has greater importance or leads to more permanent results than that which each of us must undergo in beginning his life's work. Behind is the expenditure of considerable time, effort, and money, all of which has been aimed at one goal. Every new graduate stands equipped with the necessary knowledge, ability, and skill to perform satisfactorily all that must be done. What, then, are the factors in this new experience which will modify the potentialities of each individual and eventually or immediately nurture or destroy them?

Certainly the natural abilities of every one, both mechanical and intellectual, will continually exert an influence which will determine to some degree his success. By the manner in which he meets his new responsibilities, each new member of our profession also will reflect directly the efficiency of his school both in his knowledge and professional conduct. Furthermore, the ability or the failure to adjust to this first working situation may be influenced considerably by the guidance which has been available in selecting the job.

Each of these factors is, and will continue to be, of serious importance, but there is still another factor which, more than any other, will exert the most potent influence on our new members. This is a responsibility not of the recent graduate, but of each of us already in the field. It is somewhat indefinable and abstract, but it has many real and measurable facets. Perhaps more than any other influence, it has the ability to determine the future of our profession. We refer to the sound, intelligent, meaningful, and well directed indoctrination of new therapists into their first job.

We doubt that anyone will disagree with the statement that this is important, but how many persons are really doing anything about it? Isn't it possible that a new member of the staff, whose work potential may be desperately needed, may find himself so quickly carrying a full patient load that he may skip or never learn many subtle attributes that characterize an outstanding physical therapist? Because he is capable of accomplishing a certain amount of work may make it appear that he can do without early supervision and continued instruction, but does the quality of his work verify this?

Excellence in any field is determined not by grasp of the gross abilities but rather the degree to which these are reinforced by the small details. Anyone can hammer a nail, but only a master carpenter does it with speed and accuracy. It is certain that our schools are turning out well trained people, but no one person, regardless of his excellence, can be expected to know at the time he graduates the many things that come only from experience. Left to his own devices he may learn them, but the process will be slow and perhaps at the expense of the patient. Guidance, teaching, and real indoctrination are needed and the responsibility is yours.

Association Activities

H.R. 4447 Introduced

To Provide Commissions for Male Physical Therapists

H.R. 4447 was introduced by Mrs. Frances P. Bolton, April 3, 1953 in the House of Representatives to provide for the appointment of qualified male persons as nurses, physical therapists, occupational therapists and dieticians in the United States Army Reserve.

The bill provides for striking out the term, "Women's Medical Specialist Corps," where ever it appears and inserting in lieu thereof "Army Medical Specialist Corps."

"Appointment in the Army Nurse Corps Branch and the Army Specialist Corps Branch of the United States Army Reserve may be made in such grades and under such regulations as may be prescribed by the Secretary of the Army from citizens of the United States or persons who have made a declaration of intent to become a citizen thereof, who have attained the age of twenty-one years, and who possess such physical and other qualifications as may be prescribed by the Secretary of the Army: *Provided*, that female officers appointed pursuant to the Act of June 22, 1944, and honorably separated from the service thereafter may, if otherwise qualified, be appointed in the appropriate section of the United States Army Reserve established hereby in the highest grade satisfactorily held by her in active service."

Research in Polio

The Association, aware of the great interest of physical therapists in the development of a vaccine for polio and in the use of gamma globulin for passive immunization, has arranged for a report of these studies at the annual conference. Dr. Henry W. Kumm, M.D., Assistant Director of Research, the National Foundation for Infantile Paralysis, will talk to us on Thursday, June 18.

Report of recent discoveries has been given wide circulation in the press. Your attention is called to an article in the April 11, Journal of the American Medical Association by Dr. William McD. Hammon. Dr. Hammon analyzes the use of gamma globulin in a study involving approximately 55,000 children in Texas, Utah, and Nebraska during 1951-1952 epidemics.

Physical therapy played an important part in these field studies. The degree and duration of protection from gamma globulin was determined on the number of paralytic polios in the age group under study and the extent of the paralysis. Two prime factors in determining this were the positive cell count in the spinal fluid and the amount of involvement as determined by a muscle test.

The three physical therapists assigned to the field trials were Miriam Jacobs, Georgianna Harmon, and Carmella Gonnella. Miss Jacobs participated in both the 1951 and 1952 field trials. Their careful tests and records were an integral part of the study on which Dr. Hammon based his evaluation.

The role of physical therapy in the after care of the polio patient has long been recognized. The Association is proud that physical therapy contributed so much in the prevention research.

Poster Contest

The winner was, as announced in the May *Review*, an entry submitted by the Illinois Chapter. The poster was prepared by Mrs. Janet Satz, Staff Artist, and Mrs. Jacqueline Wright, Exhibit Coordinator of the National Society for Crippled Children and Adults, Inc. The poster background is yellow with black silhouettes of a boy and a girl in the left hand corner. At the top are illustrative examples of physical therapy in black line drawings on a colored base, and in the center and down the right side, "The Door to Your Future. Join Ranks in This Proud Profession. Be a Physical Therapist."

The cash award of seventy-five dollars has been donated to the Illinois Chapter by the National Society to aid the Chapter's recruitment program.

The Association extends its deep appreciation

to all of the contestants. There were ninety-eight posters submitted from twenty-five chapters. The art class at San José College in California submitted twenty-five through the Northern California Chapter. There were many good ones, and the judges had a difficult time making a selection.

Thanks to all who gave of their time, imagination, and talent. The Association has some excellent reference material now for future posters and brochures. It was interesting to note how many entries used hands as a central theme. The new movie, as you know, is titled, "Within Our Hands."

We feel sure that through the efforts of all of you and with the help of the poster, film strips, brochure, and movie, many more will be "Joining Ranks in this Proud Profession."

Chapter Honor Roll for Poster Contest

Among the 98 entries to the Poster Contest, the following chapters were represented:

Chapters		*No. of Entries*
Northern California		27
Southern California		2
Colorado		1
Delaware		2
District of Columbia		5
Florida		2
Georgia		3
Illinois		5
Indiana		1
Kentucky		1
Massachusetts		2
Mississippi		1
Eastern Missouri		4
Western Missouri		1
New York		5
Greater New York District	3	
Central New York District	1	
Western New York District	1	
Ohio		4
Northeast District	4	
Oklahoma		2
Oregon		1
Pennsylvania		5
Puerto Rico		1
Tennessee		8
Nashville District	4	
Western District	4	
Texas		2
Central District	2	
Virginia		7
Washington		2
Wisconsin		4

Special mention goes to Northern California where 25 entries were from an art class at San Jose College, Tennessee and Virginia. Also to Puerto Rico.

Chapter News

Connecticut

A student branch of the chapter has been organized at the University of Connecticut and Miss Elma Griswold has been elected president. The student group planned a Tri-State Conference held on the campus in April which students from New York and Massachusetts were invited to attend.

At the March meeting held at the Hartford Rehabilitation Workshop, the speaker, Dr. Shindell, who is both a physician and lawyer, spoke on the legal aspects of medicine.

The chapter advisory council now includes Miss Josephine Dolan, a member of the nursing staff of the University School of Nursing.

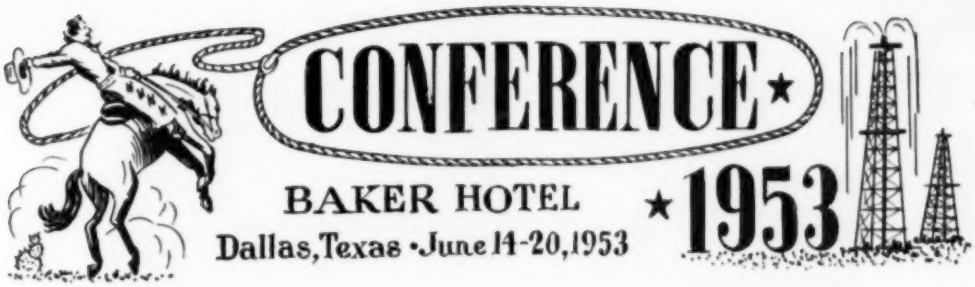
Massachusetts

The Massachusetts Chapter sponsored an all day Institute, May 2, 1953, at the Jimmy Fund Building, Boston. The program included a discussion by Dr. T. B. Quigley of the Peter Bent Brigham Hospital on "The Management of 'Frozen Shoulder' by Manipulation and ACTH." A sound film, "Functional Anatomy of the Hand," preceded Dr. Quigley's talk.

Other speakers included Mrs. Joan Vincent and Mrs. Jean Whiffen, members of the Chartered Society of Physiotherapy, England, who discussed and demonstrated, "Physical Therapy in Obstetrics"; and Eunice I. Katz, Chief Occupational Therapist of the Bay State Medical Rehabilitation Clinic, and Sarah Bassett, Chief Physical Therapist, Boston Dispensary, New England Medical Center, who spoke on "Upper Extremity Prosthetics." Miss Katz and Miss Bassett returned recently from the University of California at Los Angeles, where they attended the Course in Upper Extremity Prosthetics.

Virginia

Chapter members in 21 areas of the state have accepted the responsibility for student recruitment in each of those areas. The chapter is now incorporated as the Virginia Physical Therapy Association.



"Welcome to Fort Worth"

Have you wondered what makes Texas tick? This is a Yankee speaking who came down from the north country to find out, and saying "Howdy member, welcome to Cowtown." When you come to the Convention plan to visit Fort Worth the "Gateway to the West" and discover the working parts of this friendly city.

When you swing out of your saddle and drop your reins in old Cowtown you'll always find a welcome as friendly as the man whose name is inscribed on the city's magnificent cultural center — Will Rogers Memorial Coliseum and Auditorium. This is Forth Worth's town hall deluxe where all the citizens and guests from out of town meet on common ground to attend concerts, road shows, basketball games, industrial shows and that stupendous annual event the Southwestern Exposition and Fat Stock Show, complete with its World Championship Rodeo. For ten days each January and February the Exposition makes Forth Worth the livestock and cowboy capital of the world. Big hats everywhere — the smell of saddle leather — high heeled boots — spurs that jingle-jangle — the West has come to town.

Its got wings, too — the biggest war wings of the United States Air Force. Every day, if you glance skyward, you can see, roaring across the wild blue yonder the giant mechanical dragons that make up a vital part of the national defense. Fort Worth is the home of the B-36 largest land based bomber ever built by this nation. Men and women

Exterior of the Will Rogers Coliseum

INTERIOR OF THE WILL ROGERS COLISEUM

work in the nearly mile-long plant of Consolidated-Vultee or Convair as the natives call it. Helicopters, those mechanical heroes that evacuate seriously wounded GI's by the thousands in Korea, are manufactured by Bell aircraft.

What makes Fort Worth tick? What keeps the economic pulse beat strong? A great many agricultural products help make up the city's bloodstream, but the principle corpuscles are cattle, grain, and oil. Fort Worth's nickname is "cowtown" and it's a name well earned. It stands near the old Chisholm Trail, over which Texans drove their herds to the Kansas rail heads before the coming of the Iron Horse to Fort Worth; and from the start it has grown into the Lone Star's greatest cattle market, one of the ten largest in the nation today.

Fort Worth, because it stands sentinel at the "Gateway to the West" always has felt an affinity with nature. That's why the city boasts a big park system and why Fort Worth's Botanic Garden is known and admired by beauty lovers everywhere.

In addition to its great park system, Fort Worth is a city of big inland lakes. Like fishing? Boating? A week-end on a breeze swept shore? You'll find it all just a hop-skip-and-jump from the downtown area. At least a dozen dude ranches are within easy driving distance of Fort Worth. These ranches offer modern accommodations and still are in keeping with the traditions of the old West. Trails through timber and open plains, camp fires, chuck wagon meals, roundups, square dancing and just plain relaxing are offered.

And that is not all! They have the Cats, the Brooklyn-owned baseball club. Fort Worth is the home of the Texas Christian University "Horned Frogs." The Greater Fort Worth International Airport is in the process of being constructed and is to be equal to any airport in the world. There are two newspapers, the Fort Worth Press and the Star Telegram; eight local radio stations; beautiful homes and a grand shopping district. I could go on with the "What you'll want to see and know" business, but I suggest that you take time out sometime during the convention and see for yourself "Cowtown, the Gateway to the West."

Final Call for Conference

Hotel Reservations

There is still time. Reservation blanks are in the April and May *Reviews*.

Business Meetings and Program Schedule

(see April or May *Review*).

Registration

If you have not registered yet, you can register at Conference.

Instructional Courses

On Friday, June 19, and Saturday morning, June 20, instructional courses will be offered to members only. A member may attend only one course. Tuition, if registered at the conference — $5.00. Instructional course alone — $10.00. Members may register in advance. Space

in each course is limited and will be assigned in the order applications are received. As each course is filled, alternate assignments will be made in respect to requests.

School Section

Sunday, June 14th

10:30 to 12:30 p.m. **Breakfast and business meeting.**

1:00 to 5:00 p.m. **Workshop**—What does the School Expect of the Clinical Supervisor?

Discussion leader: Lucille Daniels—Director, Division of Physical Therapy, Stanford University.

What does the Clinical Supervisor Expect of the School?

Discussion leader: Dorothy Wagner, Supervisor, Physical Therapy Department, Michael Reese Hospital, Chicago.

7:00 to 9:00 p.m. **Recruitment** — The School's Responsibility in the Total Program.

ALL members of the Association are welcome and urged to attend the sessions.

Breakfast — Advance reservations may be made with the National Office. Price — $2.00, including gratuity.

Workshop — After the topics have been introduced by the discussion leaders, there will be group discussions.

Recruitment — There will be a report by regions of the recruitment programs being carried out by the schools — followed by general discussions.

Instructional Courses

Instructors for the special courses given at the end of the Conference in Dallas will include the following members:

Management of the Polio Patient in the Respirator
Laura Smith, Houston, Texas

Care of the Pre-School Cerebral Palsied
Robertine St. James, Galveston, Texas
Edna Blumenthal, Durham, North Carolina
Eileen Pagel, Monroe, Wisconsin
Jane Thompson, Lansing, Michigan
Kathleen Wingate, Leroy, New York

Assistive Devices
Edward Snapp, Houston, Texas
(Occupational therapists and others will also participate.)

Administration and Supervision
Sponsored by the School Section
The leader will be Dr. Harold Walker, Professor of Health, Education, University of Tennessee.

Pediatrics (Muscle Testing)
Miriam Jacobs, Leetsdale, Pennsylvania
Carmella Gonella, Gonzales, Texas
Georgianna Harmon, Stanford, California

Conference Speaker

WILLIAM A. SPENCER, M.D.

Dr. William A. Spencer, whose presentation, "Physiologic Considerations in Rehabilitation," will be a part of the symposium on "The Patient — His Evaluation and His Rehabilitation Program," is Medical Director, Southwestern Poliomyelitis Respiratory Center, Jefferson Davis Hospital, Houston, Texas, and Assistant Professor of Physiology, Instructor in Pediatrics, Baylor University College of Medicine.

Dr. Spencer received his premedical preparation at Georgetown University, Washington, D.C., where he was graduated with a B.S. degree, and his medical training at Johns Hopkins Medical School, Baltimore, Maryland, where he was awarded his M.D. degree.

After a tour of duty in the U. S. Army Medical Corps, Dr. Spencer became Instructor in Pediatrics at Baylor University College of Medicine in 1950 with teaching and clinical responsibilities. Readers of the *Review* will remember "Poliomyelitis, A Review of Current Concepts," which he wrote for the July 1951 journal.

Dr. Spencer is a member of the Harris County Medical Society, the Houston Pediatric Society, the Texas State Medical Association, and the American Medical Association.

Change in Conference Schedule

The talk on the status of research in poliomyelitis scheduled in former issues of the *Review* for Monday morning, June 15, has been changed to Thursday morning, June 18. Henry W. Kumm, M.D., Assistant Director of Research, The National Foundation for Infantile Paralysis will be the speaker.

The American Physical Therapy Association recruitment movie "Within Our Hands" will be shown on Monday morning.

Technical Exhibits

Batrow Laboratories, Inc.

You are cordially invited to a demonstration of a new type of stimulator which is finding wide use in the treatment of many types of injury cases seen in industrial medical departments.

The Birtcher Corporation

On display at the Birtcher booth will be our complete line of accepted and widely used electro-medical-surgical apparatus. Birtcher representatives will be on hand to answer all of your questions.

The Burdick Corporation

Russell Burdick will be in charge of the Burdick exhibit and we look forward to the opportunity of renewing acquaintances with old friends and meeting new ones. Our modern line of physical therapy equipment will be shown and we hope you will all pay us a visit.

S. H. Camp and Company

S. H. Camp and Company will feature the latest development in orthopedic appliances to fulfill the exacting requirements of the profession for an effective support in the conservative treatment of poliomyelitis. Experts from the Camp staff will be in attendance to answer questions about these supports and will welcome your investigation.

Chattanooga Pharmacal Company, Inc.

The Hydrocollator provides effective, versatile thermotherapy in the hospital and clinic without expensive, complicated and limited machines. So simple and safe that it can be prescribed also as supplementary treatment in the patient's home. In practically all of your physical therapy problems there is a place for the Hydrocollator.

The Coca-Cola Company

Ice cold Coca-Cola served through the courtesy and cooperation of the Coca-Cola Bottling Works of Dallas, Texas, and the Coca-Cola Company.

De Puy Manufacturing Co., Inc.

De Puy Manufacturing Company, Inc., will feature several different kinds of cervical traction apparatus; traction kits that are easy for the patient to use at home. Leg exercisers and many other items used in the field of physical therapy.

Elgin Exercise Appliance Co.

The Elgin Exercise Appliance Company invites your inspection of the Elgin Exercise Unit and the Doorway Exercise Unit. The design of the Exercise Unit is the result of extensive laboratory experiment and clinical study aimed at a quantitative method for redevelopment of major muscles and restoration of motion to major points.

Everest and Jennings

The Everest and Jennings exhibit includes Everest and Jennings wheel chairs, the new tiny tot chair and, in addition, the companion Hollywood line of chairs and walkers and accessory equipment. The display will be under the able direction of Elton Hinnant, Everest and Jennings dealer in the Dallas area.

Ille Electric Corporation

Hydromassage Subaqua Therapy Equipment. Ille Electric Corporation will demonstrate how the care of infantile paralysis, arthritis, and other disabling conditions can be greatly improved by the use of Hydromassage Subaqua Therapy Tanks. They will display a Mobile Whirlpool Bath with Mobile Adjustable High Chair and Paraffin Bath.

J. B. Lippincott Company

J. B. Lippincott Company presents for your approval a display of professional books and

journals geared to the latest and most important trends in current medicine and surgery. These publications, written and edited by men active in clinical fields and teaching, are a continuation of more than 100 years of traditionally significant publishing.

Medco Products Co.

The Medcolator Stimulator, for the stimulation of innervated muscle or muscle groups ancillary to treatment by massage, is a low volt generator that will generate plenty of your interest. Electrical muscle stimulation is a valuable form of rehabilitation therapy. Be sure to visit our booth for a personal demonstration.

Niagara Deep Massage of Dallas, Inc.

The Niagara Company will present its massage equipment and demonstrate its ability to stimulate circulation, relieve fatigue and tension — healthfully and pleasantly.

Raytheon Manufacturing Company

The Raytheon Manufacturing Company will exhibit the popular Raytheon Microtherm, the biggest advance in medical diathermy in recent years. The Microtherm utilizes radar frequency energy for the best results in deep heating, the most comfortable of treatments and extreme ease of operation. Raytheon representatives will be on hand to demonstrate the Microtherm and to answer your questions.

The Ries Corporation

"Moistaire" heat therapy equipment produces a heated environment of air saturated with water vapor, based on the principle of dew point control. This physiologically sound and safe procedure increases the volume of local blood flow measureably. It has been used consistently since 1937 and has been found to hasten convalescence of many common disabilities.

The Spinalator Company

The Spinalator is a spinal exerciser, securing passive motion of all the spinal articulations, relieving muscle contractures, spastic ligaments, fibrous ankylosis. It is perfectly controlled as to time, pressure, and area. The action of the Spinalator is rhythmic and soothing, doing everything that can be done by hand, but with much more ease and efficiency.

Teca Corporation

Teca Corporation is showing a complete line of low volt generators including its variable frequency units which are used in leading hospitals throughout the country. Also shown is the Teca Chronaxie Meter, which incorporates a number of unusual features. Kindly ask for a demonstration of any unit exhibited.

Thermo-Electric Company

Dickson Paraffin Baths pioneered and developed in cooperation with Cleveland Hospitals where Dickson Paraffin Baths have been in continuous use for ten to fifteen years. Mahogany mouldings designed for the comfort of the patient. Double control of the melting element insures maximum safety. Patented drain. Two models will be shown.

Whitehall Electro Medical Co., Inc.

We hope you will be pleased with our exhibit of Whitehall Whirlpool Baths — we promise to do our best to make it a good one for you. Our booth will feature the exclusive one motor whirlpool bath with autocounterbalancer and high pressure jet, all Whitehall firsts.

Zimmer Manufacturing Company

Zimmer Manufacturing Company will display and demonstrate the new Gable-McKinney Walker, a light weight, versatile walking aid for indoor and outdoor use which can be supplied with stair climbing feature. Also shown will be other aids for the physical therapy program.

Post Conference Tours

Members may arrange post conference tours to Mexico by train or plane. For specific information write: Mr. F. Alatorre, General Agent, National Railways of Mexico, 2401 Transit Tower, San Antonio 5, Texas; or Mrs. A. C. Stevens, American Airlines, Inc., 100 Park Avenue, New York 17, New York.

Our Looks Are Deceiving Us

To the Editor—

As an avid proponent of our recruitment program, I have been met consistently with a most disturbing situation — the appearance of our therapists on the job. It is not difficult to encounter almost any type of apparel from well-groomed personnel to something resembling the scrubwoman or maintenance variety. How much influence does appearance have in helping the prospective student decide on a profession? Would you be attracted to a profession by a soiled uniform, run down and dirty shoes, unkept hairdo or no uniform at all? How necessary is it for us as a profession to look like one? Do we have a moral obligation to our profession to look professional?

On a "Career Day" panel recently were three nurses, all in uniform and bubbling over with enthusiasm. Obviously they had sold the group on their profession long before saying one word. The uniforms of the Armed Forces are always an excellent selling point on such occasions.

It is one thing to talk to prospective therapists with natural and instinctive enthusiasm, but quite another to show them on the job activities with the same amount of enthusiasm. Too often, yes, much too often, the therapists' shoes are dirty, run over at the heels, and with shoe strings which might be capable of standing by themselves. At times therapists wear colored shoes with white uniforms. In some institutions the therapists wear street clothes, preferably sweaters, skirts and loafers with a long white coat, although they readily admit that one cannot work effectively in a long coat. We might take a professional tip from our sister auxiliary groups, particularly nursing — a profession which has long looked like one.

If we are to approach any measure of success in our recruitment program, it would seem a number one *must* on the part of our membership to at least present a professional appearance.

MILDRED HEAP

World Confederation For Physical Therapy

World Congress Notes

Capitular Mass at Westminster Cathedral

In addition to the Service at St. Paul's Cathedral on Sunday, September 6, Capitular Mass will be held at Westminster Cathedral at 10:30 a.m. Members of the Congress will be warmly welcomed.

Reception to Be Given at Lancaster House

Since the Intermediate Program was published, news has been received by the Chartered Society of Physiotherapy that Her Majesty's Government will give a reception at Lancaster House in the evening of Monday, September 7.

Benjamin M. Walpole

Word has been received of the death of Benjamin M. Walpole on April 3, 1953. Mr. Walpole was Educational Director, Children's Rehabilitation Institute, Cockeysville, Maryland, and for the past fifteen years, since its founding in 1938, served as its administrator.

Army Announces Selections for Physical Therapy Course

Appointment of thirteen young women college graduates as second lieutenants in the Women Specialist Corps for admission to the 12-month physical therapy course conducted by the Army Medical Service at the Medical Field Service School, Fort Sam Houston, Texas, has been announced by the Department of the Army.

This course, which began May 25, is the first 1953 class and will be followed by another beginning October 10 at the school.

Annual dues were payable on May 1st. Your prompt response will be appreciated.

May we also call to your attention that according to the Bylaws "any active member not actively employed in physical therapy may, on application to the Executive Committee and on approval thereof by the Committee, be made an inactive member."

Membership News

Florence E. Case

Florence E. Case of Nebraska died suddenly of a brain tumor, March 30. Miss Case, who was a graduate nurse, received her certificate in physical therapy from the Medical College of Virginia in 1946 and was on the instructional staff of the College for two years. She had been a member of the American Physical Therapy Association since her graduation.

Miss Case had been chief physical therapist at St. Francis Hospital, Grand Island, Nebraska, since 1948 and had assumed a great deal of responsibility for care of poliomyelitis patients in 1952 during Nebraska's greatest polio epidemic. She not only established an efficient service for poliomyelitis patients, but also created respect for and interest in physical therapy in the community. She was a person who was liked by everyone. She was a devoted friend and colleague, and all who knew her will miss her very much.

Marriages

Elizabeth Carper of Philadelphia, Pa., now Mrs. Elizabeth C. Hitchcock, Media, Pa.
Mary Wesely of Tucson, Ariz., now Mrs. Mary W. Ferguson, Tucson, Ariz.
Annette Davis of New York, N. Y., now Mrs. Annette D. Paul, New York, N. Y.
Helen M. Murray of Wilmington, Dela., now Mrs. Helen M. Halpin, Okinawa.
Alice D. Porter of Chester, Conn., now Mrs. Alice P. Wightman, Chester, Conn.
Margaret Fitzgerald of Rocky Hill, Conn., to Norman R. Meier, Auburndale, Mass.
Sara Maclean of Cambridge, Mass., now Mrs. Sara M. Walker, Cambridge, Mass.
Lois Wilcox of Dover, N. J., to William F. Strobridge, Concord, N. H.
Shirley Leonard of Richmond, Calif., now Mrs. Shirley L. Comazzi, Richmond, Calif.
Lt. Claire Turner of Hot Springs, Ark., now Mrs. Claire T. Giuranna, Stanford, Calif.
Beatrice Levine of Brookline, Mass., to Paul W. Yarin, Somerville, Mass.
Margaret Dow of Sea Girt, N. J., now Mrs. Margaret D. Bridges, Cranston, R. I.
Lt. Theodora V. Anuskewicz of Phoenixville, Pa., to Paul A. Heeser, Ardsley, Pa.
Barbara Spaulding of St. Louis, Mo., now Mrs. Barbara S. Alexander, Lebanon, Ill.
Jeanne M. Le Roy of Travis AFB, Calif., now Mrs. Jeanne L. Capes, Travis AFB, Calif.

School News

Physical Therapy Class Makes an Analysis of *Review* Articles

A class project of the School of Physical Therapy, Charity Hospital of Louisiana, at New Orleans, has provided a statistical analysis of the contents of the Physical Therapy Review from 1930 to 1952.

The class summarized the work of the project in the following comment: "It gives a general picture of the kinds of materials which have appeared in the Review since 1930; of the persons who have been the editors of the Review; of the presidents of the American Physical Therapy Association; of the trends in the growth of the Association; and the development of the schools of physical therapy approved by the Council on Medical Education and Hospitals.

"It is interesting to note the differences in emphases occurring in the changes in editorship; and especially the number of articles in the earlier compared with the later issues. This latter may be due to the increasing length of the individual studies, but certainly due also to the expansion of work in public relations and recruitment. The decrease in number of schools in 1946 may be accounted for by the closing of Army schools following World War II; and the increase in chapters at the 1940 and post-World War II periods is striking."

Bouvé-Boston School
Medford, Massachusetts

Bouvé-Boston School is an independent school located on the campus of Tufts College, in a new building with up-to-date facilities for professional training. Because of its affiliation with Tufts, graduates receive the B.S. degree in education from that institution upon completion of the course. At Bouvé-Boston School two courses

BOUVÉ-BOSTON SCHOOL

are offered—physical therapy and physical education. The physical therapy course, which is approved by the Council on Medical Education and Hospitals of the American Medical Association, admits students from high school and also accepts students with advanced college credit. Four college years are included in the course with a four weeks' period of clinical practice experience following the junior year and an eight weeks' period following the senior year. Background courses in liberal arts and physical education give a broad approach to physical therapy.

Professional training in physical therapy is composed of theory courses in subjects such as medicine, surgery, anatomy, and physiology; laboratory practice classes in which the students study and practice physical therapy procedures using classmates as patients; and finally clinical practice assignments in Boston hospitals and rehabilitation clinics, where students receive practical experience. We are most closely affiliated with the Department of Clinical Rehabilitation of the New England Medical Center, which is the major teaching hospital of the Tufts College Medical School. Some scholarship help is available to qualified students.

The social life of the school is closely connected with that of coeducational Tufts College. Bouvé-Boston students may join the Glee Club, the Mountain Club, and other similar campus organizations. Some of the students live in the school dormitories and others commute from nearby towns. As Medford is only a short distance from Boston, students may enjoy the many social and educational opportunities offered there. The charm of this historically interesting old city comes to mean much to students during their years at college.

The school provides placement service for its graduates and maintains a continuing interest in them. There is also an active alumnae association group.

New Student Members

Boston University

Frances Ammen
Ann Bloor
Agnes R. Brady
Beatrice A. Campbell
Betty J. Childs
Eleanor Del Bonis
Ann E. Dingwall
Grace M. Duchin
Ann M. Gillis
Barbara L. Hawley
Ruth Ann Huber
Flora M. Long
Johanna Loubser
Louise M. Marchetti
Claire M. Pickener
Joyce M. Pitman
Dorothy J. Potter
Beverly R. Price
Ellen M. Sansone
Irene Shao
Rosalie B. Silver
Jane Smith
Janet M. Tenney
Sara M. Walker
Shirley F. West

Columbia University

Samuel B. Feitelberg

Saint Louis University
Cynthia Ann Clauder — Henry W. H. Ho-Asjoe
Eric J. Crabbe — Mary T. Schneider
Sister Mary Jonathan Slattery

Stanford University
Frank M. Pierson — Ruth F. Rosenfelder

University of California
Irene Novikoff

University of Connecticut
Barbara Atwood — Richard D. McNamara
Fay Edsall — Doris Oakley
Martha Eigen — Edward J. Onofrio
Miriam Everett — John R. Popolizio
Elma T. Griswold — Margaret A. Savoye
Joan E. Hawley — Jean A. Skower
Helene L. Lillis — Joan Zink
Joan A. Martinez — James G. Zuccardy

General News

Rehabilitation Loses World Leader

Dr. Harold Balme, one of the world's foremost authorities on the rehabilitation of the handicapped, died on February 13th following an operation at a hospital near his home in England. His loss is felt keenly by all those who knew him and his many accomplishments in the development of international cooperation in serving the disabled.

As consultant advisor on rehabilitation to the United Nations, the World Health Organization and the UNICEF, Dr. Balme served as Chairman of the UN Technical Working Group on the Rehabilitation of the Handicapped and was instrumental in the establishment and development of the coordinated international rehabilitation program being carried out by the UN and Specialized Agencies. He was a member of the International Society's Professional Advisory Committee and served as an expert consultant in rehabilitation for the World Veterans Federation.

Dr. Balme most recently served as Director of the Group Training Course on the Rehabilitation of the Adult Disabled which was held in Sweden, Finland and Denmark under the joint auspices of the UN, the World Health Organization and the International Labour Organization. The report of this course, which was prepared by Dr. Balme just prior to his death and has been published by the United Nations, is regarded as a most valuable addition to the international literature in the field.

The Conference of Non-Governmental Organizations which met at the UN in February adopted unanimously a resolution acknowledging with deep gratitude the contribution which Dr. Balme made to the development of services for the disabled. He served as Chairman of the First NGO Conference on Rehabilitation held in Geneva in 1951.

Handicapped Child Studied by Asia Conference

Delegates from 26 countries and representatives of seven international governmental agencies and 15 international voluntary organizations attended the International Study Conference on Child Welfare held in Bombay, India, December 5 to 12, 1952. Convened by the International Union for Child Welfare and the Indian Council for Child Welfare, the Conference considered subjects related to its theme, "Child Welfare in Relation to Social Services and the Raising of Standards of Living."

A special session of the Conference, planned in cooperation with the International Society for the Welfare of Cripples, was devoted to "The Care and Education of the Handicapped Child." Dr. Henry H. Kessler, Past President of the ISWC, served as chairman of this session. Among those on the program were Dr. Yaeko Kawai, of the Japanese Society for Crippled Children; Mrs. Kamala Nimbkar, Director of the Occupational Therapy Training School in Bombay, India; and Dr. R. D. Soeharso, head of the Rehabilitation Centre, Solo, Indonesia.

The findings of the special session on the handicapped child included a recognition of the importance of local, national and international cooperation in providing a complete range of services to meet the physical, psychological, social, educational and vocational needs of children with disabilities.

Schools of Physical Therapy

APPROVED BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS
OF THE AMERICAN MEDICAL ASSOCIATION

Graduates of these schools are eligible for membership in the American Physical Therapy Association.

California

School of Physical Therapy
Childrens Hospital Society
4614 Sunset Blvd., Los Angeles 27
(Univ. of California, Los Angeles)

School of Physical Therapy
College of Medical Evangelists
White Memorial Hospital
Boyle & Michigan Aves.
Los Angeles 33

Department of Physical Therapy
University of Southern California
University Park
Los Angeles 7

Curriculum in Physical Therapy
School of Medicine
University of California
3rd & Parnassus
San Francisco 22

Division of Physical Therapy
Stanford University
Stanford

Colorado

School of Physical Therapy
Department of Medicine
University of Colorado
4200 East Ninth Ave.
Denver 7

Connecticut

School of Physical Therapy
University of Connecticut
Box U 101
Storrs

Illinois

†*School of Physical Therapy
The Medical School, Northwestern University
303 East Chicago Ave.
Chicago 11

Iowa

†Department of Physical Therapy
State University of Iowa
University Hospitals
Iowa City

Kansas

School of Physical Therapy
University of Kansas — Medical Center
Kansas City 3

Louisiana

†Charity Hospital School of Physical Therapy
1532 Tulane Ave.
New Orleans

Massachusetts

*Course in Physical Therapy
Bouve-Boston School
Medford 55
(Tufts College, Medford)

*Program in Physical Therapy
Simmons College
Children's Medical Center
300 Longwood Ave.
Boston 15

*Department of Physical Therapy
Boston University
Sargent College of Physical Education
6 Everett St.
Cambridge 38

Michigan

Curriculum in Physical Therapy
Dept. of Physical Medicine & Rehabilitation
University Hospital
University of Michigan
1313 East Ann St.
Ann Arbor

Minnesota

Course in Physical Medicine
The Medical School
University of Minnesota
Minneapolis 14

†School of Physical Therapy
Mayo Clinic
Rochester

Missouri

Department of Physical Therapy
Division of Auxiliary Medical Services
School of Medicine
Washington University
Barnes Hospital
600 S. Kingshighway
St. Louis 10

Division of Health & Hospital Services
St. Louis University School of Nursing
1402 South Grand Blvd.
St. Louis 4

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* Only women accepted.
† Only certificate awarded.

New York

*Physical Therapy School
Albany Hospital
New Scotland Ave.
Albany 1
(Russell Sage College, Troy)

Program in Physical Therapy
University of Buffalo
2183 Main St.
Buffalo 14

Division of Physical Therapy
College of Physicians & Surgeons
Columbia University
630 W. 168th St.
New York 32

Curriculum in Physical Therapy
School of Education
New York University
Washington Square
New York 3

North Carolina

†Division of Physical Therapy
School of Medicine
Duke University
Durham

Ohio

School of Physical Therapy
The Frank E. Bunts Educational Institute
Euclid & East 93rd St.
Cleveland 6
(Cleveland Clinic)

Pennsylvania

†The D. T. Watson School of Physiatrics
Leetsdale

Division of Physical Therapy
School of Auxiliary Medical Services
University of Pennsylvania
1818 Lombard St.
Philadelphia 46

Texas

†Grady Vaughn School of Physical Therapy
Baylor University Hospital
Dallas 1

†School of Physical Therapy
Hermann Hospital
Houston 5

School of Physical Therapy
The University of Texas — Medical Branch
Galveston

Virginia

Physical Therapy School
Baruch Center of Phys. Med. & Rehabilitation
Medical College of Virginia
Richmond 19
(Richmond Professional Institute)

Wisconsin

Section in Physical Medicine
Medical School
University of Wisconsin
Madison

U. S. Army Medical Service

†* Physical Therapy Course

Medical Field Service School
Brooke Army Medical Center
Fort Sam Houston, Texas and
Brooke, Letterman, and Walter
Reed Army Hospitals

Write to: The Surgeon General
Department of the Army
Washington 25, D. C.
Attention: Personnel Division

* Only women accepted.
† Only certificate awarded.

Please direct all inquiries regarding tuition, entrance requirements and other specific information to the school and *not* to the American Physical Therapy Association.

Institute Offers Rehabilitation Course

New York University-Bellevue Medical Center, Institute of Physical Medicine and Rehabilitation, in conjunction with New York University School of Education, is offering a four weeks' course in "Advanced Physical Rehabilitation Methods for Physical Therapists." The dates are as follows: November 23 to December 18, 1953; February 1 to February 26, 1954; May 2 to May 29, 1954. Four points university credit will be given. For information regarding tuition and registrations fees and for application blanks, write to Edith Buchwald, Director, Rehabilitation Courses for Physical Therapists, Institute of Physical Medicine and Rehabilitation, 400 East 34 Street, New York 16, New York.

Abstracts

Brachial and Antebrachial Arterial Patterns, A Study of 750 Extremities

Lawrence J. McCormack, M.D., Earl W. Cauldwell, M.D., and Barry J. Anson, Ph.D. SURG., GYNEC. AND OBST., 96:43-54, January, 1953.

The purpose of this study was to review the literature and present the anatomy of major arterial variations encountered in 750 upper extremities. The literature revealed that much work had been done regarding the variations in the origin and course of the principal arteries of the upper extremities, but that the contributors had failed to treat the subject in sufficient detail. The authors are of the opinion that an accurate knowledge of the relationships and course of these major arterial conduits, and particularly of their variational patterns, is of considerable importance in conducting reparative surgery in the arm, forearm, and hand. Their importance lies in the fact that a large artery may occur where the existence of a capacious vessel would not ordinarily be expected. Because the greater number of aberrant radial and ulnar arteries arise in the proximal half of the arm, the occurrence of accessory major vascular channels through the greater extent of the arm is precluded. Consequently, serious secondary hemorrhage might occur in the depths of a wound when the operator has ligated or identified only those vessels which are normally encountered in the area. Confusion might also arise in establishing proper relationships were such an aberrant artery found in intimate association with formed elements of the median nerve, or were the median nerve clasped between two or more arteries of major caliber. Of practical importance, also, is the common occurrence of arterial variation in two other areas; namely, the antecubital region and the dorsolateral aspect of the wrist and hand.

Many complications have arisen from these variations. Intra-arterial injection of diagnostic or therapeutic preparations may be of profound clinical significance. The catastrophic sequelae of accidental intra-arterial injection of pentothal sodium in 12 cases has been described in the literature. Gangrene of fingers, hand, and forearm occurred in 5 of these with subsequent amputation; gangrene of one or more fingers was observed in 4 cases and required operative removal. Contraction deformities of the fingers and atrophy of antebrachial musculature resulted, each in a single case. In at least five cases the injection was probably made into a superficial ulnar artery and in 5 cases into the brachial artery. Gangrene of the fingers has also followed accidental intra-arterial injection of contrast media for roentgenography.

In the series of 750 upper extremities the authors found that 18.53 per cent possessed major variations in brachial and antebrachial arterial patterns. In 364 cadavers, with both upper extremities represented, arterial variations occurred bilaterally in 6.23 per cent and unilaterally in 24.45, for a total incidence of 30.77 per cent. Departures from the anatomic norm occurred more often on the right than on the left side. The most common variations were as follows: high origin of the radial artery, 15.45 per cent; high origin and unusual course of the ulnar artery, 1.9 per cent; a superficial brachial artery, forming a common trunk for both radial and ulnar arteries, 1.27 per cent.

Muscular Fasciculation and Reactive Myotonia in Polyneuritis

C. Worster-Drought, and Frank Sargent, BRAIN, 75:595-600, December, 1952.

Fasciculation is defined as transient vermicular twitching visible in voluntary muscle, affecting small or larger bundles of muscle fibers without producing any movement of the muscle as a whole. The occurrence in seven cases of polyneuritis of the Guillain-Barre type is described. In addition to fasciculation all seven showed early paresthesia of extremities, widespread paralysis of limb muscles, loss of tendon reflexes, little or no demonstrable loss of sensation, increase of total protein in cerebrospinal fluid and retention of faradic responses in affected muscles.

In one case, reactive myotonia was present in extensor muscles and brachioradialis of each forearm.

Various hypotheses as to nature and site of origin of fasciculation are discussed. The view is advanced that while disturbance at the myoneural junction may be the immediate exciting cause of the muscle fiber twitch, disease of the spinal cord and especially of the anterior horn cells plays an important part. Fasciculation is most often seen in diseases of the spinal cord, accompanying slow destruction of the cord as in syringomyelia. Polyneuritis is an inflammatory process of peripheral neurones which sometimes affects anterior horn cells, a process usually reversible. It is probable that in polyneuritis showing fasciculation, the disease has spread to the anterior horn cells in the spinal cord.

Reactive myotonia is an occasional but unusual symptom of polyneuritis and other diseases of lower motor neurones, and is probably due to abnormal sensitivity of muscle fibers following partial denervation.

Physiological Day-Night Cycle in Global Flights

H. Strughold, M.D., Ph.D., J. AVIATION MED., 23:464-473, October 1952.

The physiological diurnal rhythm or day-night cycle is manifested by phases of rest and activity or by sleep and wakefulness, and rhythmic metabolic changes are the background of this phenomenon.

This cycle is a kind of conditioned reflex and firmly established in man. It is impossible to break this cycle over a long period of time; sleep is essential. The diurnal cycle can be lengthened or shortened to a limited degree only. The shift in the phases in the day-night cycle cannot be achieved instantly.

The Air Force is now faced with a new type of shift of the physiological diurnal cycle imposed by traveling. It has been estimated that in crossing the Atlantic or Pacific, because of the difference in time, it will take a person at least one week to become physiologically adapted to the day-night cycle of the new place. This phenomenon is being described as geographic physiological phase shift or as incomplete time or cycle adaptation.

In case of the sick or wounded such as air evacuees during the first days after arrival, a gradual adjustment of the time table for eating, sleeping, and treatment is recommended. When taking the temperature for diagnostic purposes, one must consider the possible incomplete adaptation to the new physiological day-night cycle.

It is also pointed out by the author that after a flight causing a time change of five to six hours there seems to be a decrease in degree of efficiency for two to three days. This should be considered in troops ready for battle and also possibly in diplomatic and economic fields.

Mumps During Pregnancy

D. Bowers, M.D., WESTERN J. SURG., OBST., & GYNEC., 61:72-73, February, 1953.

Recorded cases of fetal involvements as a result of maternal antepartum effects, especially mumps, are poorly documented. The authors present brief histories of two cases selected from 84 to assimilate information concerning this interesting condition. Only the cases in which association of mumps and pregnancy were clinically significant are reported. Cases which included descriptions of suppurative parotitis or complications of both mumps and rubella were excluded in this study. Also excluded were cases in which epidemic parotitis followed abortion or labor, since determination of the effects of the mumps was uncertain due to the unknown precise incubation period of the disease.

Of the two cases reported in the paper in which definite known combinations of mumps and pregnancy were present, one woman in the tenth week of her fourth pregnancy delivered a normal appearing male fetus following four days of sublabial progesterone therapy for complaints of vaginal bleeding, cramps, and bilateral parotitis. The other woman complained of vaginal bleeding, low abdominal cramps in the fifth week of her fourth pregnancy, and developed bilateral parotitis. After two days she expelled macerated products of conception and following this developed meningo-encephalitis symptoms. With supportive therapy the patient regained her health. Of the tabulated 84 cases there were 9 abortions or still births, 12 congenitally defected conceptions, and 63 normal children. Results of this study show that mumps during pregnancy, though rare, should be viewed with dismay, but further cases must be reported before the effects of mumps during pregnancy can be accurately assessed. Mumps virus also may infect the ovaries and disturb the hormonal balances necessary for normal pregnancy.

In summary, recorded cases of mumps during pregnancy are tabulated, two new cases are reported, and it is suggested that fetal injury or death may result from mumps during pregnancy.

Personal Experience in the Surgical Treatment of Epilepsy

S. Obrador, J. NEUROSURG., X:52-63, January 1953.

A brief review is presented of personal experiences with 130 patients with epilepsy over a period of five years. The cases presented are divided into the following: (1) 90 cases of expansive intracranial lesions in which epilepsy was secondary to the lesions (special mention, because of rarity, is made of tuberculomas, cysticercosis and hydatid cysts); (2) Focal cerebral lesions of which 11 were localized cerebral scar and 19 cases cerebral atrophies; (3) 10 cases of psychomotor and other functional disturbances.

In intracranial lesions the neurosurgeon makes an effort to extirpate the abnormal mass and leave as clean and small a cerebral scar as possible removing all the damaged cortex. Results are usually evaluated on the basis of the late survival period and not by the presence or absence of postoperative attacks.

Figures from operations in the series of localized cerebral scars which were found in the frontal, rolandic, parietal, and occipital lobes confirm the view that development of epilepsy after injury to the brain is slow and progressive. In all cases an excision of the meningocerebral scar was performed and excisions in the frontal or occipital lobes were more extensive than in the rolandic areas.

Atrophic lesions were treated surgically and subdivided into cerebral hemiatrophy, porencephalic cysts and malformations, and cortical atrophy of unknown origin. The generally unsatisfactory results after limited surgical resections led to the trial of hemispherectomy or hemicortication by removing the cortex of the affected hemisphere and sparing the basal ganglion. Hemispherectomy is a good operation for treatment of severe epileptic disturbances of the infantile hemiplegias but, beside surgical risk there is the possibility that electrical abnormalities and infrequent clinical discharges may persist after operation.

Anterior temporal lobectomy seems to be a useful treatment for the pure forms of psychomotor epilepsy with an electrical focus in the temporal region but fails in other epileptics who have generalized convulsive seizures associated with psychomotor attacks.

Treatment of Multiple Sclerosis with Low Fat Diet

Roy L. Swank, ARCH. NEUROL. AND PSYCHIAT. 69:1, 91-103, Jan., 1953.

Forty patients with a definite diagnosis of multiple sclerosis were placed on low fat diets and maintained thus for two to three and a half years or more after a control period of three years. The diets contained less than 40 grams of fat. The daily protein was maintained at 50 grams while the total caloric intake was low. As a result of this regime, in the group of 34 patients of the early exacerbating-remitting type, 3 showed evidences of deterioration, 6 remained unchanged and 25 showed improvement in performance. During the control period this group had 96 exacerbations against 40 in the dietary period; 13 of the latter followed dietary indiscretions (high fat intake). The time between attacks dropped from 10 months to nearly 30 months. In the group of 11 patients of the late progressive exacerbating-remitting type, 5 showed deterioration, 4 remained unchanged and two showed improvement. During the control period this group had 21 exacerbations against 6 during the diet period. The exacerbations during periods of diet were generally milder.

It may be hypothesized that patients with multiple sclerosis have a basic defect in the suspension stability of their blood which is upset by hyperlipemia. An aggregation or clumping of erythrocytes which may or may not be of pathological significance appears to be associated with the disease. This same phenomenon of clumping and adhesiveness of the blood has been noted in dogs following high fat meals. Swank and Hain proved that tightly adherent aggregations of blood could produce demyelinating lesions in the CNS which resemble the lesions found in multiple sclerosis. There is also the possibility that such lesions are caused by transient ischemia. Other studies have linked multiple sclerosis with plasma proteins and possibly lipid metabolism.

Preliminary Experience with Smith-Petersen's Hip Cup Arthroplasty

Aage Berntsen and Arne Bertelsen, ACTA ORTHOPAEDICA SCANDINAVICA 22:147-152, Fasc. 2, 1952.

The choice between different methods of hip arthroplasty is of increasing importance with the development of Judet alloplasty of the femoral head as opposed to the Smith-Petersen vitallium hip-cup arthroplasty. Smith-Petersen claims good results in 80 per cent of 500 hips operated on. In other series the percentage of satisfactory results varies from 50 to 80 per cent, while some writers completely disown the procedure. The authors present an analysis of a series of 37 hip-cup operations in 36 patients with osteoarthritis. Satisfactory results were obtained in 50 per cent. Of the three cardinal indications for hip-cup surgery (pain, walking trouble and decreased movement), pain appears to be the principal one relieved by cup arthroplasty.

The authors analyze the possibilities for improvement of results through altered method and improved technic. Referred pain to the lateral thigh, difficulty in ambulation and muscular weakness were postoperative findings. Four patients showed definite Trendelenburg's sign, and others showed moderate loss of power in gluteal muscles and rectus femoris. A gain in abduction range was commonly accompanied by a loss in hip flexion. The authors suggest that improvement may be reached by:

1) Systematic extirpation of the lateral cutaneous femoral nerve to eliminate referred pain in this nerve's region,

2) Systematic postoperative training of the gluteal muscles and the rectus femoris, as insufficient power in these muscles is the main reason for instability, walking problems, and lack of flexion power,

3) Visualization of the nerve to the rectus femoris at surgery, as impaired rectus femoris function may be caused by lesion or traction on the nerve.

The formation of osteophytes after operation is the chief drawback of the operation, with possible surgical removal necessary later. The authors suggest that if alloplasty of the femoral head in the future is as successful as now indicated, the vitallium hip-cup arthroplasty may be abandoned in favor of the Judet procedure.

Showmanship in Medical Teaching

Walter Freeman, J. MED. EDUC. 28:1: 31-35, Jan. 1953 (Formerly the J. Assoc. Am. Med. Coll.)

The formal lecture is the easiest and yet the hardest way to transfer a teacher's notes into a student's notebook. A good lecturer is one who can hold the attention of a class by the addition or depletion of certain mannerisms, by exhibiting a verbal fluency, thereby putting the class at ease, and approaching the problem of the moment with sincerity and enthusiasm. Audience participation is also a part of the dexterity exercised by the good teacher, and aids in dispelling the notion of passivity or spoon-feeding that prevails in didactic teaching. Berating and criticizing raise barriers in a student-teacher relationship, while a tactful manner of pointing out and discussing errors or disagreements favors the flow of ideas and arouses interest. The teacher must take a stand and interpret the findings in as direct and practical a way as possible.

The teacher must have a certain manual dexterity which will enable him to demonstrate manual technics with alacrity as well as to develop his ideas by diagramming on a blackboard. Audio-visual aids and demonstrations may be used to great advantage, remembering that simplicity and directness are the qualities to be desired. The test of showmanship lies in the presentation of data in such a manner that the student carries away the fundamentals instead of being confused with trivialities.

Effect of Electrical Stimulation upon Blood Flow and Temperature of Skeletal Muscle

Barbara F. Randall, Ph.D., C. J. Imig, Ph.D., and H. M. Hines, Ph.D., AM. J. PHYS. MED., 32:22-30, Feb. 1953.

The knowledge that electrical stimulation is being employed to reduce muscular spasticity in cases with spinal cord injury and to improve the functional condition of partially paralyzed muscle in poliomyelitis prompted the authors to investigate the effect of this therapy on blood flow and temperature of skeletal muscle.

Studies were made of the effects of three different patterns of electrical stimulation on volume of blood flow and deep tissue temperature in the extremities of dogs. Blood flow was continuously recorded in the femoral artery by means of an electromagnetic flow meter. Electrical stimulation was found to be an effective measure for increasing the volume of blood flow. The general pattern of response was a gradual increase in blood flow during stimulation followed in many experiments by a precipitous increase in flow following cessation of stimulation. After this increase the blood flow returned to control values within a period of several minutes. The increases found in muscle temperature were not of sufficient magnitude to account for the increases in volume blood flow. The efficacy of electrical stimulation as a possible modality for increasing blood flow through tissues was discussed.

The Duration of Neuromuscular Function after Nerve Section in Man

William M. Landau, J. NEUROSURG., 10:64-68, January 1953.

In order to find out how soon conduction in the distal segment of severed peripheral nerve disappears, a variety of experiments was tried. Electrical stimulation was applied to the peripheral portions of human nerves after traumatic section and to macaque nerves after surgical section.

From eight human case histories studied, five which followed complete nerve section showed diminished maximal contraction strength of the distal segment, which was usually apparent 48 hours after the lesion was made. Complete loss of excitability was seen between 91 and 128 hours after section. In two cases, the nerve was not divided entirely across but showed the same loss of electrical excitability seen with the above cases. In the last case of a less severe partial transection, no significant excitability changes occurred.

A small portable thyraton stimulator was used to deliver 0.1mfd condenser charges about one a second. Stimulation at such low frequencies was well tolerated and the identification of direct response was distinct from reflex contractions that may be confused with high frequency. The technic used in this

study is a simple direct method of establishing the diagnosis of complete Wallerian degeneration after nerve injury.

The result, as in other mammals, was that motor function is completely abolished 3 to 5 days after the lesion is produced and the muscle is completely denervated by the end of the 6th day.

The Aims of Child Rearing

Harry Bakwin, NEW ENGLAND J. MED., 248:227-231, Feb. 5, 1953.

This article brings out the changes of the medical world and the place the pediatrician plays in mental health. Though it is not the author's intention to give an impression that he is skeptical of clinical psychology and psychiatry and its achievements, he discusses the confusion created by widely accepted concepts held by psychiatrists which do not fit into the pediatrician's everyday experiences. Pediatricians will go from one extreme to the other as long as they center attention on technics of child rearing, yet fail in comprehending the essence and principle aim of child rearing which is character building.

The author presents the views of the famous anthropologists, Orlansky and Benedict, who studied the effects of infantile and childhood experiences in shaping adult personality. They found persons permanently damaged by improper training procedures were those who had lived under unfavorable circumstances over long periods during childhood.

The tendency of some current psychiatric teaching has been to increase parental anxiety, to shake the faith of parents in their own ability to rear children, and to undermine parental authority.

It is the pediatrician's task to foster a wholesome atmosphere in the home, to bolster self-confidence and to see that parents are not deflected from the aim of child rearing by false teachings and unsubstantiated rationalization. The good physician uses many devices to foster good parent-child relationship by praise of the baby, praise of the mother's adept handling of the baby, admiration for the family group, and so on.

The author emphasizes the rights of parents to bring up their children as they see fit, but states that this right implies an obligation to rear children in accordance with the noble ideals of a free society.

The Use of Tracheotomy in the Treatment of Crushing Injuries of the Chest

B. Noland Carter, M.D., and Jerome Giuseffi, M.D., SURG., GYNEC. AND OBST., 96:55-64, January, 1953.

The authors have previously reported six cases of crushing chest injuries successfully treated by use of tracheotomy and now report eleven additional cases in which this method has been a salient feature of management. They point out that this type of injury is steadily increasing and that surgical treatment to date has proved inadequate.

The effects of tracheotomy are two-fold, mechanical and physiological. The mechanical effects comprise: (1) the ability to maintain a clear airway, and (2) the relief of laryngeal obstruction. These have been recognized for sometime but there has been no mention of the physiological effects in the literature. The writers feel that the physiologic effects are of real importance and that the principal ones are: (1) a decrease in the amount of dead space in the respiratory tree, (2) a decrease in resistance to breathing both on inspiration and expiration, (3) a stabilization of loose segments of the thoracic cage wherever they exist, and (4) gives easy access to the tracheobronchial tree for aspiration of retained secretions.

They see broad application of these physiologic principles in those instances in which paradoxical movement or low tidal volume are of serious moment. Such a condition is encountered in those cases in which too extensive rib resections have been performed in thoracoplasty or in the removal of large tumors of the sternum or ribs; they are also found in cases with unstable mediastinum in the presence of open pneumothorax.

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Physical Therapy Association.

Book Reviews . . . . .

Psychological Aspects of Physical Disability. *By James F. Garrett, Ph.D., Editor Chief, Division of Program Services, Office of Vocational Rehabilitation, Washington, D.C. Federal Security Agency, Rehabilitation Service Series, Number 210. Paper; price $.45. Pp. 195. U.S. Government Printing Office, Washington 25, D.C., 1952.*

One of the difficulties of sustaining interest in psychological publications is the problem of finding material suitably relevant to the area of the physically handicapped, without having to spend a great deal of time reading through statistical data and lengthy dissertations.

James F. Garrett, Certified Psychologist and Chief of the Division of Program Services, Office of Vocational Rehabilitation, Washington, D.C., has edited a bulletin which briefly condenses some of the latest studies and conclusions about psychological aspects of disability, and implications for rehabilitation. A prolific author, Dr. Garrett has spent years working with the disabled at the Institute of Physical Medicine, New York City, and teaching at New York University.

Quite unlike many publications, this report represents more than a mere "assembly" of authoritative but nonsynchronous, poorly correlated material. Although numbering only 195 pages, it actually represents an integration of thinking by no less than 18 authors. Among the authorities are Howard A. Rusk, Eugene Taylor, Karl Menninger, Stanley Berger, Morton A. Seidenfeld, and others.

Written primarily for rehabilitation counselors, this bulletin should be equally interesting and valuable to all other professional workers to whom psychological aspects of physical disability are of mutual concern. This includes doctors, therapists, nurses and medical social workers alike.

Physical therapists will find an abundance of psychological concepts, aspects of disability, and related information about constructive worker-client (patient) relationships which bear practical and significant implications for them.

As a reference source, it should

encourage greater insight into adjustment problems of the disabled and thus augment the benefits of rehabilitation procedures.

The first three chapters of the report are general in nature and deal with the psychological, psychiatric, and social aspects of disability. They contain extremely valuable information about situations most frequently encountered among the disabled in general. The titles are, respectively, Team Approach in Rehabilitation and the Psychologist's Role, Psychiatric Aspects of Physical Disability, and The Social Psychology of Adjustment to Physical Disability.

Subsequent chapters deal with the psychological aspects of different disability groups. They include Cerebral Palsy, Multiple Sclerosis, Amputations, Tuberculosis, Facial Disfigurement, Deafness, Hard of Hearing, Partially Seeing, and The Blind.

Sections which functionally seem unrelated to physical therapy, such as those dealing with deafness, actually increase interest because there is always the possibility of having to deal with this condition in conjunction with other disabilities. It is also probable that many therapists will find the discussion of factors such as levels of intelligence, personal adjustment, and vocational aspiration as explored through testing and counseling to be of considerable interest. Thus, through better understanding of what transpires beyond physical restoration, therapists are likely to make greater contributions toward total rehabilitation of their patients.

Among other things, interesting observations are made regarding the social psychology of adjustment. For example, it is noted that for optimal adjustment two basic psychological needs of man must be satisfied to some degree. They are the need for self-esteem, and social status.

Also noteworthy is the fact that adjustment and degree of handicap are hardly correlated at all, and that merely reducing the handicap may have little adjustive effect.

Emphasis is placed on the tremendous influence of worker-client relationships in hindering or promoting progress.

This book contains such a wealth of practical information that one can only touch on the highlights. The discussions regarding the problems of insecurity, self-devaluation, motivation, and realistic acceptance of disability are particularly outstanding. Teamwork through coordination and cooperation of all the specialties, plus recognition of community responsibility and action, are also stressed as vital requisites to success.

There are many specific recommendations as to what the rehabilitation worker may do in a variety of situations. These recommendations, along with convenient chapter summaries, make the book an extremely useful guide in dealing with the disabled.

A documentation of some of the most up-to-date thinking on the subject, *Psychological Aspects of Physical Disability* is strongly recommended reading.

Psychology of Physical Illness. *By Leopold Bellak, M.D., Clinical Assistant Professor of Psychiatry, New York Medical College, Flower and Fifth Avenue Hospitals, New York City. Cloth; price $5.50. Pp. 243. Grune & Stratton, Inc., New York, N.Y., 1952.*

As Dr. Bellak states in the introduction of the book, the medical profession is becoming increasingly aware of the need for treatment of the individual as a whole and for an understanding of the psychosomatic nature of many illnesses. Articles are included by authorities on specialties which concern themselves with psychiatric considerations of surgery, gynecology, dermatology, dentistry, pediatric practice, general medicine, etc., in an attempt to emphasize this viewpoint.

The book advocates a more dynamic approach to medical problems generally by courses for the doctor-in-training on these subjects which include general psychodynamics, and by what is called a psychotherapeutic attitude on the part of the practitioner.

Because of his extensive background along medical and academic lines, Dr. Bellak seems well qualified to make such a timely recommendation and to support it by evidence from the various fields which are included.

Although the scope of the book is wide of necessity, the style of writing in all of the articles is clear and direct, and unity is achieved by the common focus of psychodynamic emphasis. The use of extensive illustrative case material adds to the interest value of the book. Bibliography on the particular specialty is included at the end of each article.

That there is an urgent need for education such as the book provides, is beyond question, and the information which is presented is of excellent quality, accuracy, and timeliness. Much has been written in recent years about psychosomatic medicine, but the psychodynamics of this problem have to date been seriously neglected. It is therefore believed that the present book makes a real contribution to the medical practitioner and to the science of medicine.

Fundamentals of Neurology. *By Ernest Gardner, M.D., Professor of Anatomy, Wayne University College of Medicine. Second Edition. Cloth binding; price $4.75. Pp. 359; illus. 142. W. B. Saunders Co., Philadelphia, Pa., 1952.*

In this small book the author has attempted to present the general principles and basic concepts of neurology suited to the level of the student in medicine and related fields such as psychology, biology, nursing, physical therapy and so on.

The book starts on a relatively simple level which is probably well suited to its intended audience. The first six chapters are a review of gross and microscopic anatomy with good illustrations. The language is clear and only in a few places are there introduced facts which may be too complicated. Chapters seven through nine are a review of important principles of neurophysiology. Here the author deals with the important problems of excitations and conduction, general properties of the reflex arc and structures mediating reception and response. A noble effort has been made to present complex electrophysiology in simple language. There can be no argument with the facts of the presentation but they are certainly condensed. However, the appropriateness of the inclusion of such items as strength-duration curves is to be questioned. Considerable previous knowledge would have to be possessed by the reader to really understand what is given here because of the capsule-like presentation. His discussion of other items like sensory and motor endings is very fine.

The remainder of the book is a series of chapters discussing the anatomico-physiology of motion, sensation, special senses, visceral activity and various levels of the spinal cord and brain. There is a final chapter on learning, language, conditioning, and effect. The general principles and presentation in all of these is good for the most part with

the one criticism that seems apparent throughout the book. There is an obvious effort to include everything which makes it necessary to touch lightly on many things. For example, on pages 145 and 146 his discussion of the function of the pyramidal and extra-pyramidal systems is so condensed as to be difficult for any novice to understand. Then a few pages farther on the discussion of the clinical importance of the motor areas and pathways is quite scholarly. The same problem appears in the discussion of functions of vision, hearing, visceral activity etc. where highly technical physiologic problems are presented in a very few sentences.

Despite the criticisms offered this reviewer hastens to point out that the principle and manner of the book are highly commendable and there is great need for such a book. The summary at the end of each chapter and the historical notes about names in neurology are fine. The illustrations are excellent. In order to be better suited to the intended audience the complex problems should either be deleted or perhaps be amplified to the point where they are more easily comprehended.

Pain Sensations and Reactions. *By James D. Hardy, Ph.D., Associate Professor of Physiology, Cornell University Medical College; Harold G. Wolff, M.D., Professor of Medicine (Neurology), Cornell University Medical College; Helen Goodell, B.S., Research Fellow in Medicine, Cornell University Medical College. Cloth; price $6.50. Pp. 435; illus. 139. Williams & Wilkins Co., Baltimore, Md., 1952.*

Doctors Harold G. Wolff and James D. Hardy and their associates have conducted meticulous and monumental work research in the field of painful sensations. Their present work *Pain Sensations and Reactions* is a summation of their important studies. As a collection of their material, the book is an excellent one. As a useful text on the subject of pain, it is extremely limited. One cannot agree with the authors for example, that the subject of causalgia can be lightly dismissed by arbitrarily including it under a list of varieties of hyperalgesia. In the introduction in which a historical review is given, one cannot condone the omission of Paget and Weir Mitchell.

The book is very difficult to read. However, the precise tabulation of experimental data and procedures is excellent.

The book is chiefly of interest to those working in the field. Inasmuch as they are already aware of the work of the authors, it is not believed that they will find this book of any particular value. The chapter on reaction to pain does little to extend the appeal of the book.

The book is recommended only as a reference handbook for libraries. In this capacity it is an excellent compendium of laboratory work performed by the authors.

A Bladder and Bowel Training Program for Patients with Spinal Cord Disease. *By Edith Buchwald, M.A., Margaret McCormack, R.N., and Emilie Raby, R.N. Pamphlet, price $1.00. Pp. 35; 14 illus.* Rehabilitation Monograph III. *Institute of Physical Medicine and Rehabilitation, 400 East 34 Street, New York City, 1952.*

Miss Buchwald is a physical therapist outstanding in the special field of activities of daily living, and especially gifted in presenting pictorially the many detailed steps so important to a teaching program both for patients and prospective teachers. She is Director of Rehabilitation Courses for Physical Therapists at the Institute of Physical Medicine and Rehabilitation, and the author of *Physical Rehabilitation for Daily Living*, a book published in 1952 by the McGraw-Hill Company which is a photographic review of the steps necessary for attaining proficiency in daily life activities.

Miss Buchwald's interest in the severely disabled has led her into the difficult special field of bladder and bowel control. This pamphlet is the result of great attention to details over ten years, coupled with determination to provide practical aids to offset the handicap of bladder and bowel incontinence. The pamphlet offers excellent practical ideas and photographs which will stimulate the patient, therapist, nurse and other rehabilitation workers, and serve as an inspiration and basis for further investigation. One senses the validity of the information, as the pamphlet reflects intensive work with patients.

The authors' assumption throughout is that it is usually possible to improve bladder and bowel control, despite years of incontinence, when no training has been given. They state that some improvement has been seen in fifty out of fifty-five patients with spinal cord disease of the following varieties: transverse myelitis, traumatic myelopathies, multiple sclerosis, spina bifida and other degenerative spinal cord disorders. Four case studies are presented. Some investigators might like to see detailed data on all fifty-five patients with "before" and "after" information available for easier interpretation of what improvements were actually effected.

The second strongly emphasized conviction is that motivating patients to learn the activities of daily living has a beneficial effect upon bladder and bowel function. Specific activities in such a practical daily activity program toward independence are: moving about freely under one's own power; and getting about in the upright position within the limits of disability. Bladder and bowels function better as normal conditions are approximated. Therefore, one must learn to sit up. Enemas are a great inconvenience and a threat to independence, so the authors have set up a specific bowel routine. A photograph of special protective pants is included. This feature of daily activity independence is well illustrated by photographs.

A Daily Bowel and Bladder Training Schedule form allows for evaluation of a patient's habits over an initial observation period of three to four days. An advantage of the form is that it allows for entry of subsequent planned times for specific activities, such as measured liquid intake and times for voiding which are listed by therapist or nurse; as well as what actually takes place which is listed by the patient. Thus achievement can be checked against aims, as patient and worker develop the program together.

Individuality is stressed, so that a study of bladder and bowel habits is essential in each case. The aim then is to establish some habit patterns, if none exist, or to perfect those which are revealed by the record. The scheme entails a study of the following five factors: (1) liquid intake, (2) time relationship of drinking and voiding, (3) sensations and signs associated with voiding, (4) movements or activities accompanying involuntary voiding and (5) frequency of involuntary voiding.

Circumstances are thus outwitted by an indefatigable physical therapist and the essential observations and aid of her two rehabilitation nurse co-workers.

Classified WANT-ADS

REGISTERED PHYSICAL THERAPIST wanted immediately for completely modern, 109-bed general hospital in Pacific Northwest. Hospital, A.C.S. approved, operated by General Electric Company. Two full-time physical therapists already on duty. Good salary. Liberal employee benefits include low-cost health and life insurance, paid vacations and holidays, pension plan, plus many others. Pleasant, modern community of 25,000 people. Climate sunny and healthful. Apply by air-mail letter to: Administrator, Kadlec Hospital, Richland, Washington.

CALIFORNIA needs qualified physical therapist at Sunrise School for cerebral palsy children, Hayward in the San Francisco Bay area. Therapy is under state supervision and excellent local medical direction. Education Department functions under Alameda County School Program. Forty-hour week, excellent starting salary, four annual raises, full Civil Service benefits, fine cooperative teaching staff, pleasant sunny building make for happy working hours. Write Mrs. Jane M. McCloud, Pres., Parent's Assoc., 3160 Memorial Drive, Hayward, Calif.

PHYSICAL THERAPIST for modern 600-bed hospital. Complete facilities available. Opportunity for variety cases. Five-day week. Insurances, paid vacation, sick leave. Affiliated with Northwestern University. Write to: Personnel, Wesley Memorial Hospital, 250 East Superior St., Chicago 11, Illinois.

WANTED: A QUALIFIED PHYSICAL THERAPIST and coordinator for outpatient Cerebral Palsy Center. Five-day week, 1 month vacation with pay, salary commensurate with experience. Write Dr. F. B. Kilgore, Ritter Building, Huntington, West Virginia.

QUALIFIED PHYSICAL THERAPIST (male or female). One now and another in the fall. Either experienced or inexperienced therapist. Rapidly growing Rehabilitation Center, good opportunity for promotion. Salary schedule designed to attract the best. Five-day week, Monday through Friday, 8:30 a.m. to 4:30 p.m. Holidays off, paid vacation and sick leave. Social Security, Workmen's Compensation, Blue Cross and Blue Shield. Contact Roy E. Patton, Executive Director, Crossroads Rehabilitation Center, 3001 North New Jersey Street, Indianapolis 5, Indiana.

WANTED: PHYSICAL THERAPIST, female, for large general hospital located in Medical Center of Chicago. Five-day, 40-hr. week, Blue Cross, group insurance and other benefits. For further details write Miss Jean Grothkob, Personnel Dir. Presbyterian Hosp., 1753 W. Congress St., Chicago, Ill.

PHYSICAL THERAPIST, registered, wanted in 113-bed hospital located near Chicago, Ill. Active department. Excellent salary, vacation and sick leave benefits. Apply Personnel Director, Highland Park Hospital, Highland Park, Illinois.

WANTED: A QUALIFIED physical therapist in an outpatient treatment center. Excellent working conditions. Salary commensurate with experience. Benefits: 10 days sick leave, two weeks' paid vacation, life insurance after one year's employment. Write Dr. Alvin R. Carpenter, Medical Director, Rehabilitation Services, Inc., 200 Court Street, Binghamton, N. Y.

CEREBRAL PALSY CLINIC needs STAFF therapist for cerebral palsy outpatient department in a children's hospital. Cerebral palsy training preferred. Attractive salary, forty-hour week, sick leave, four-week vacation. Apply to Maybelle Townsley, Director, Cerebral Palsy Clinic, The Children's Hospital, Nineteenth Avenue at Downing Street, Denver 18, Colorado.

WANTED: Physical therapist for department serving 7 hospital medical centers. Patients mostly orthopedic, many children. Treatments stress rehabilitation using swimming pool and functional room as well as usual modalities. As part of Clinics' research unit, department takes part in medical school program. Salary good, 4-week vacation, 2-week sick leave, use of University recreational facilities. Write to Nancy Watts, Chief Physical Therapist, University of Chicago Clinics, 970 East 59th Street, Chicago, Illinois.

PHYSICAL THERAPIST – Liberal salary with regular increases, 40-hour week, to work in a large county hospital. Liberal retirement, paid sick leave, and vacations. Automatic annual salary increases. Must be citizen of U. S. and have completed an approved course in physical therapy. For information and application write: Wayne County Civil Service Commission, 2200 Cadillac Tower, Detroit 26, Mich.

PHYSICAL THERAPISTS (CEREBRAL PALSY) wanted in California. Excellent opportunities and working conditions. Excellent salary. For additional information and applications write to Kern County Personnel Dept., 3805 Chester Ave., Bakersfield, California.

PHYSICAL THERAPIST: Fully qualified; for general physical medicine in an established outpatient clinic associated with new Sinai Hospital; 5-day, 37½-hour week. Liberal sick leave, holiday, and vacation benefits. Good salary with beginning rate based on qualifications. Write Mr. M. J. Lawrence, Director, North End Clinic, 936 Holbrook Avenue, Detroit 11, Michigan.

WANTED: QUALIFIED PHYSICAL THERAPIST for Cerebral Palsy Clinic in Charleston, W. Va. Contact Mrs. Charles C. Wise, President, Kanawha County Society for Crippled Children and Adults, Inc., 418 Professional Building, Charleston 1, W. Va.

WANTED: STAFF PHYSICAL THERAPIST for rapidly expanding dept. including all phases of poliomyelitis. Working conditions excellent. Salary open. Contact L. G. Trousdale, Administrator, St. Luke's Hospital, Summit Blvd. and A St., Spokane 11, Washington.

WANTED: TWO QUALIFIED PHYSICAL THERAPISTS to work in established department in new 700-bed hospital. Work is supervised by specialist in Physical Medicine and Rehabilitation. Good starting salary, vacation, sick leave and retirement benefits. Write Herman J. Bearzy, M.D., Director of Physical Medicine and Rehabilitation, Miami Valley Hospital, Dayton 9, Ohio.

PHYSICAL THERAPIST for state cerebral palsy training center. New building allowing increased enrollment necessitates addition to staff. Write James B. Moss, Administrative Director, Oklahoma Cerebral Palsy Institute, P.O. Box 311, Norman, Oklahoma, giving qualifications.

WANTED BY SEPTEMBER FIRST physical therapists, salary commensurate with training and experience at hospital day school located beautiful university town in Northwest. School serves handicapped children between ages of three to fourteen. Contract job requirements 137 working days per year paid on annual basis over twelve months. Employment period from September first to June fifteenth each year with Christmas and Easter Holidays observed. Apply Howard F. Feast, Executive Director, Oregon Society for Crippled Children and Adults, Inc., 1135 Southwest Yamhill Street, Portland 5, Oregon.

WANTED: Qualified physical therapist for 100-bed children's orthopedic hospital. Active department with modern equipment in treatment, hydrotherapy, and new functional room; 40-hour week, good starting salary with regular increases, vacation, liberal sick leave. Contact: Miss Anna B. Quinn, Administrator, Kosair Crippled Children Hospital, Louisville, Ky.

WANTED: REGISTERED physical therapists (5) for modern cerebral palsy outpatient treatment center; 35-hour week. Four weeks' vacation with pay. Good starting salary with annual increases. Uniforms and laundering supplied. Women preferred. Write C. H. Wiemer, Executive Director, United Cerebral Palsy Center, Roosevelt, Long Island, New York.

WANTED: PHYSICAL THERAPIST for small department in 76-bed hospital. New equipment, salary good, paid vacation, sick leave, other personnel benefits. Apply Larimer County Hospital, Fort Collins, Colorado.

WANTED: PHYSICAL THERAPIST for 60-bed children's orthopedic hospital; 40-hour week, vacation and sick leave. Write to: Alma M. Uhrhammer, Shriners Hospital for Crippled Children, Twin Cities Unit, Minneapolis, Minnesota.

WANTED: PHYSICAL THERAPIST for small department in 76-bed hospital. New equipment, salary good, paid vacation, sick leave, other personnel benefits. Apply Larimer County Hospital, Fort Collins, Colorado.

WANTED: QUALIFIED PHYSICAL THERAPISTS interested in service in the public health field. Opportunity as a junior staff member to work under the guidance of a qualified, experienced senior physical therapist. University study available through local facilities. Good personnel policies. Good salary dependent on experience. Immediate placement. Write to Ruth E. TeLinde, Executive Director, Visiting Nurse Association, 1234 North Prospect Avenue, Milwaukee, Wisconsin.

WANTED: PHYSICAL THERAPISTS—Children's convalescent hospital, affiliated with Western Reserve University and University Hospitals; 40-hour week; 6 holidays; annual vacation and sick leave with pay. Maintenance optional at low cost. Write for illustrated booklet. Assistant Director, Rainbow Hospital, Cleveland 21, Ohio.

WANTED: QUALIFIED PHYSICAL THERAPIST for 300-bed general hospital. New department fully equipped for handling all types of patients, including outpatients. Polio and orthopedic cases predominant. Forty-hour week, paid vacation and sick leave. For further details write to: Ada E. Harris, P.T., St. Mary's Hospital, Madison, Wisconsin.

COLORADO—Wanted: A qualified physical therapist experienced in children's work and polio who is a recent graduate of the Graduate Course at Warm Springs. An excellent opportunity for a person who, in cooperation with a similarly trained occupational therapist, can set up a functional testing and training unit for the rehabilitation of upper extremity involved polios. Liberal personnel policies. Salary open. Write: Director of Physical Therapy, Children's Hospital, Denver, Colorado.

Position Wanted

QUALIFIED PHYSICAL THERAPIST (male), with eleven years' experience in physical therapy and postgraduate preparation in administrative rehabilitation, desires position in supervisory capacity. Address replies to Box 84, care of the PHYSICAL THERAPY REVIEW, 1790 Broadway, New York 19, N. Y.

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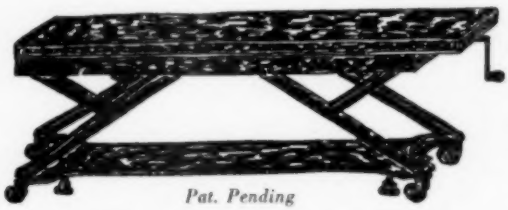

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